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## METHOD AND RESULTS

ESSAYS

THOMAS H. HUXLEY

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RICHARD CLAY AND SONS, LIMITED LONDON AND BUNGAY

### PREFACE

THE fourth of the Collected Essays" in the volume now published gives an account of the indispensable conditions of scientific assent, as they are defined by the author of the funous "Discours de la Méthode"

The other eight set forth the results which, in my judgment, are attained by the application of the "Method" of Descartes to the investigation of problems of widely various kinds, in the right solution of which we are all deeply interested. Hence I have given the volume the title of "Method and Results"

Written, for the most part, in the scant lessure of pressing occupations, or in the intervals of ill-health, these essays are free neither from superfluities in the way of repetition, nor from deficiencies which, I doubt not, will be even more conspicuous to other eyes than they are to my

own. But so far as their substance goes, I find nothing to alter in them,—though the oldest bears the date of 1866. Whether that is evidence of the soundness of my opinions, or of my having made no progress in wisdom for the last quarter of a century, must be left to the courteous reader to decide

T H. H.

Hodfslet, Eastbourne, Junuary 16th, 1895

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#### AUTOBIOGRAPHY

And when I consider, in one view, the many things which I have upon my hands, I feel the buildague of being employed in this minner at my time of life. But, in another view, and taking in all cheumstances these things, as thining as they may appear, no less than things of greater importance seem to be put upon me to do.—Bishop Butler to the Duckess of Some set

THE "many things" to which the Duchess's correspondent bere refers are the repairs and improvements of the episcopal scat at Auckland I doubt if the great apologist, greater in nothing than in the simple dignity of his character, would have considered the writing an account of himself as a thing which could be put upon him to dowhatever circumstances might be taken in But the good bishop lived in an age when a man might write books and yet be permitted to keep his private existence to himself, in the pre-Boswellian epoch, when the germ of the photographer lay in the womb of the distant future, and

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the interviewer who pervades our age was an unforeseen, indeed unimaginable, buth of time

At present, the most convinced believer the aphonsm 'Bene qui latuit, bene vixit," is not always able to act up to it An importunate person informs him that his portrait is about to be published and will be accompanied by a biography which the importunate person proposes to write The sufferer knows what that means, either he undertakes to revise the 'biography" or he does not In the former case, he makes himself responsible; in the latter, he allows the publication of a mass of more or less fulsome maccuracies for which he will be held responsible by those who are familiar with the prevalent art self-advertisement. On the whole, it may be better to get over the "burlesque of being employed in this manner" and do the thing himself.

It was by reflections of this kind that, some years ago, I was led to write and permit the publication of the subjoined sketch.

I was born about eight o'clock in the morning on the 4th of May, 1825, at Ealing, which was, at that time, as quiet a little country village as could be found within half-a-dozen miles of Hyde Park Corner. Now it is a suburb of London with, I believe, 30,000 inhabitants. My father was one of the masters in a large semi-public school which at

one time had a high reputation. I am not aware that any portents preceded my arrival in this world, but, in my childhood, I remember hearing a traditional account of the manner in which I lost the chance of an endowment of great practical value. The windows of my mother's room were open, in consequence of the unusual waimth of the weather. For the same reason, probably, a neigh-

bouring beehive had swarmed, and the new colony, pitching on the window-sill, was making its way into the room when the hornfield nurse shut down If that well-meaning woman had only abstained from her ill-timed interference, the swaim might have settled on my lips, and I should have been endowed with that mellifluous eloquence which, in this country, leads far more surely than worth, capacity, or honest work, to the highest places in Church and State But the opportunity was lost, and I have been obliged to content myself through life with saving what I mean in the plainest of plain language, than which, I suppose, there is no habit more runous to a man's prospects of advancement Why I was christened Thomas Henry I do not know, but it is a curious chance that my parents should have fixed for my usual denomination upon the name of that particular Apostle with whom I

have always felt most sympathy Physically and mentally I am the son of my mother so completely—even down to peculiar movements of the hands,

which made then appearance in me as I reached the age she had when I noticed them—that I can hardly find any trace of my father in myself, except an inborn faculty for drawing, which unfortunately, in my case, has never been cultivated, a hot temper, and that amount of tenacity of purpose which unfriendly observers sometimes call obstinacy

My mother was a slender brunette, of an emotional and energetic temperament, and possessed of the most piercing black eyes I ever saw in a woman's head. With no more education than other women of the middle classes in her day, she had an excellent mental capacity Her most distinguishing characteristic, however, was rapidity of thought. If one ventured to suggest she had not taken much time to arrive at any conclusion, she would say, 'I cannot help it, things flash across me" That peculiarity has been passed on to me in full strength - it has often stood me in good stead, it has sometimes played me sad tricks, and it has always been a danger But, after all, if my time were to come over again, there is nothing I would less willingly part with than my inheritance of mother wit

I have next to nothing to say about my childhood. In later years my mother, looking at me almost repreachfully, would sometimes say, "Ah! you were such a pretty boy!" whence I had no difficulty in concluding that I had not

fulfilled my early promise in the matter of looks. In fact, I have a distinct recollection of certain curls of which I was vain, and of a conviction that I closely resembled that handsome, courtly gentleman Sir Herbert Oakley, who was vical of our parish, and who was as a god to us country folk, because he was occasionally visited by the then Prince George of Cambridge. Tremember turning my panafore wrong side forwards in order to represent a surplice, and preaching to my mother's maids in the kitchen as nearly as possible in Sir Horbert's manner one Sunday morning when the rest of the family were at church. That is the earliest indication I can call to mind of the strong clenical affinities which my friend Mr Herbert Spencer has always ascribed to me, though I fancy they have for the most part remained in a latent state

My regular school training was of the briefest, perhaps fortunately, for though my way of life has made me acquainted with all sorts and conditions of men, from the highest to the lowest, I deliberately affirm that the society I fell into at school was the worst I have ever known. We boys were average lads, with much the same inherent capacity for good and evil as any others, but the people who were set over us cared about as much for our intellectual and moral welfare as if they were baby-farmers. We were left to the operation of the struggle for existence among ourselves, and

bullying was the least of the ill practices current among us Almost the only cheorful reminiscence in connection with the place which arises in my mind is that of a battle I had with one of my classmates, who had bullied me until I could stand it no longer. I was a very slight lad, but there was a wild-cat element in me which, when roused, made up for lack of weight, and I licked my adversary effectually However, one of my first experiences of the extremely rough-and-ready nature of justice, as exhibited by the course of things in general, arose out of the fact that I—the victor-had a black eye, while he—the vanquished -had none, so that I got into disgrace and he did not We made it up, and thereafter I was unmolested One of the greatest shocks I ever received in my life was to be told a dozon years afterwards by the groom who brought me my horse in a stable-yard in Sydney that he was my quondam antagonist. He had a long story of family misfortune to account for his position, but at that time it was necessary to deal very cantiously with mysterious strangers in New South Wales and on inquiry I found that the unfortunate young man had not only been "sent out," but had undergone more than one colonial conviction

As I grew older, my great desire was to be a mechanical engineer, but the fates were against this and, while very young, I commenced the study of medicine under a medical brother-in-law. But,

though the Institute of Mechanical Engineers would certainly not own me, I am not sure that  $\dot{ ext{I}}$ have not all along been a sort of mechanical engmeer in partibus infidelium I am now occasionally hoursfied to think how very little I ever knew or cared about medicine as the art of healing The only part of my professional course which really and deeply interested me was physiology, which is the mechanical engineering of living machines, and, notwithstanding that natural science has been my proper business, I am afraid there is very little of the genuine naturalist in me I never collected anything, and species work was always a burden to me, what I cared for was the architectural and engineering part of the business, the working out the wonderful unity of plan in the thousands and thousands of diverse living constructions, and the modifications of similar apparatuses to serve diverse ends The extraordinary attraction I felt towards the study of the intricacies of living structure nearly proved fatal to me at the outset I was a mere boy-I think between thirteen and fourteen years of agewhen I was taken by some older student friends of mine to the first post-morton examination I ever attended All my life I have been most unfortunately sensitive to the disagreeables which attend anatomical pursuits, but on this occasion my curiosity overpowered all other feelings, and I spent two or three hours in gratifying it I did

not cut myself, and none of the ordinary symptoms of dissection-poison supervened, but poisoned I was somehow, and I remember sinking into a strange state of apathy By way of a last chance, I was sent to the care of some good, kind people, friends of my father's who lived in a farmhouse in the heart of Warwickshire I remember staggering from my bed to the window on the bright spring morning after my amival, and throwing open the casement. Life seemed to come back on the wings of the breeze, and to this day the faint odour of wood-smoke like that which floated across the farm-yard in the early morning, is as good to me as the "sweet south upon a bed of violets' I soon recovered but for years I suffered from occasional paroxysms of internal pain, and from that time my constant friend, hypochondriacal dyspepsia, commenced his half century of cotenancy of my fleshly tabernacle

Looking back on my "Lehrjahie," I am sony to say that I do not think that any account of my doings as a student would tend to edification. In fact, I should distinctly warn ingenious youth to avoid imitating my example. I worked extremely hard when it pleased me, and when it did not—which was a very frequent case—I was extremely idle (unless making caricatures of one's pastors and masters is to be called a branch of industry), or else wasted my energies in wrong directions. I read everything I could lay hands upon, in-

cluding novels and took up all sorts of prusuits to drop them again quite as speedily. No doubt it was very largely my own fault, but the only instruction from which I ever obtained the proper effect of education was that which I received from Mr Whaiton Jones, who was the lecturer on physiology at the Charing Cross School of Medi-The extent and precision of his knowledge impressed me greatly, and the severe exactness of his method of lecturing was quite to my taste do not know that I have ever felt so much respect for anybody as a teacher before or since I worked hard to obtain his approbation, and he was extiemely kind and helpful to the youngster who, I am afraid, took up more of his time than he had any light to do It was he who suggested the publication of my first scientific paper-a very little one-in the Medical Gazette of 1845, and most kindly corrected the literary faults which abounded in it, short as it was for at that time, and for many years afterwards, I detested the trouble of writing and would take no pains over it

It was in the early spring of 1846, that, having thished my obligatory medical studies and passed the first M.B examination at the London University—though I was still too young to qualify at the College of Surgeons—I was talking to a fellow-student (the present entinent physician, Sir Joseph Fayici), and wondering what I should do to meet the imperative necessity for earning my own bread,

when my friend suggested that I should write to Sir William Burnett, at that time Director-General for the Medical Service of the Navy, for an appointment I thought this rather a strong thing to do. as Sn William was personally unknown to me, but my cheery friend would not listen to my scruples, so I went to my lodgings and wrote the best letter I could devise A few days afterwards I received the usual official circular of acknowledgment, but at the bottom there was written an instruction to call at Somerset House on such a day I thought that looked like business, so at the appointed time I called and sent in my card, while I waited in Sir William's ante-room He was a tall, shrewd-looking old gentleman, with a broad Scotch accent—and I think I see him now as he entered with my card in his hand The first thing he did was to return it, with the frugal reminder that I should probably find it useful on some other occasion. The second was to ask whether I was an Irishman I suppose the air of modesty about my appeal must have struck him I satisfied the Director-General that I was English to the backbone, and he made some inquiries as to my student career, finally desning me to hold myself ready for examination. Having passed this, I was in Her Majesty's Service; and entered on the books of Nclson's old ship, the Victory, for duty at Haslar Hospital, about a couple of months after I made my application

My official chief at Haslar was a very remark. able person, the late Sn John Richardson an excellent naturalist, and far-famed as an indomitable Arctic traveller He was a silent, reserved man, outside the circle of his family and intimates. and, having a full share of youthful vanity, I was extremely disgusted to find that "Old John," as we irreverent youngsters called him, took not the slightest notice of my worshipful self either the first time I attended him, as it was my duty to do. or for some weeks afterwards. I am afraid to think of the lengths to which my tongue may have run on the subject of the churlishness of the chief, who was, in truth, one of the kindest-hearted and most considerate of men But one day, as I was crossing the hospital square, Sir John stopped me, and heaped coals of fire on my head by telling me that he had tried to get me one of the resident appointments, much coveted by the assistantsurgeons, but that the Admiralty had put in another man. "However," said he, "I mean to keep you here till I can get you something you will like," and turned upon his beel without waiting for the thanks I stammered out That explained how it was I had not been packed off to the West Coast of Africa like some of my juniors, and why, eventually, Inemained altogether seven months at Haslar

Atter a long interval, during which "Old John" ignored my existence almost as completely

as before, he stopped me again as we met in a casual way, and describing the service on which the Ruttlesnake was likely to be employed, and that Captam Owen Studey, who was to command the ship, had asked him to recommend an assistant surgeon who knew something of science, would I like that? Of course I jumped at the offer Very well I give you leave, go to London at once and see Captain Stanley" I went, saw my future commander, who was very civil to me, and promised to ask that I should be appointed to his ship, as in due time I was. It is a singular thing that, during the few months of my stay at Haslar, I had among my messmates two future Directors-General of the Medical Service of the Navy (Sn Alexander Amstrong and Sn John Watt-Reid), with the present President of the College of Physicians and my kindest of doctors Sir Andrew Clark

Life on board Her Majesty's ships in those days was a very different affair from what it is now, and ours was exceptionally rough, as we were often many months without receiving letters or seeing any civilised people but ourselves. In exchange, we had the interest of being about the last voyagers, I suppose, to whom it could be possible to meet with people who know nothing of fire-arms—as we did on the south Coast of New Guinea—and of making acquaintance with a variety of interesting savage and semi-civilised

people. But, apart from experience of this kind and the opportunities offered for scientific work, to me personally the cruise was extremely valu-It was good for me to live under sharp discipline, to be down on the realities of existence by living on base necessaries; to find out how extremely well worth living life seemed to be when one woke up from a night's rest on a soft plank, with the sky for canopy and cocoa and weevilly biscuit the sole prospect for breakfast, and, more especially, to learn to work for the sake of what I got for myself out of it, even if it all went to the bottom and I along with it. My brother officers were as good fellows as sailors ought to be and generally are, but, naturally, they neither knew nor cared anything about my pulsuits, nor understood why I should be so zealous in pursuit of the objects which my friends, the middles. christened "Buffons," after the title conspicuous on a volume of the "Suites \( \) Buffon," which stood on my shelf in the chart room

During the four years of our absence, I sent home communication after communication to the "Linnean Society," with the same result as that obtained by Noah when he sent the raven out of his ail. Tried at last of hearing nothing about them, I determined to do or die and in 1849 I drew up a more elaborate paper and forwarded it to the Royal Society. This was my dove, if I had only known it. But owing to the movements of

the ship, I heard nothing of that either until my return to England in the latter end of the year 1850, when I found that it was printed and published, and that a huge packet of separate comes awaited me. When I hear some of my young friends complain of want of sympathy and encouragement, I am inclined to think that my naval life was not the least valuable part of my education.

Three years after my return were occupied by a battle between my scientific friends on the one hand and the Admiralty on the other, as to whether the latter ought, or ought not, to act up to the spirit of a pledge they had given to encourage officers who had done scientific work by contributing to the expense of publishing mine. At last the Admiralty getting tired, I suppose, out short the discussion by ordering me to join a ship, which thing I declined to do, and as Rastignac, in the Père Gonot says to Pans, I said to London "d nows deux." I desued to obtain a Professorship of either Physiology or Comparative Anatomy, and as vacancies occurred I applied, but in vain friend Professor Tyndall and I were candidates at the same time he for the Chair of Physics and I for that of Natural History in the University of Toronto, which fortunately as it turned out, would not look at either of us I say fortunately, not from any lack of respect for Toronto, but because I soon made up my mind that London was the place for me, and hence I have steadily declined

the inducements to leave it, which have at various times been offered. At last, in 1854, on the translation of my warm friend Edward Forbes, to Edinburgh, Sir Henry De la Beche, the Director-General of the Geological Survey, offered me the post Forbes vacated of Paleontologist and Lectures on Natural History. I refused the former point blank, and accepted the latter only provisionally, telling Sir Henry that I did not care for fossils, and that I should give up Natural History as soon as I could get a physiological post. But I held the office for thirty-one years, and a large part of my work has been paleontological

At that tune I disliked public speaking, and had a firm conviction that I should break down every time I opened my mouth I believe I had every fault a speaker could have (except talking at random or indulging in thetoric), when I spoke to the first important audience I ever addressed, on a Friday evening at the Royal Institution, in 1852. Yet, I must confess to having been guilty, malgré mon, of as much public speaking as most of my contemporaries, and for the last ten years it ceased to be so much of a bugbear to me. I used to pity myself for having to go through this training, but I am now more disposed to compassionate the unfortunate audiences, especially my ever-friendly hearers at the Royal Institution, who were the subjects of my oratorical experiments.

The last thing that it would be proper for me

to do would be to speak of the work of my hie, or to say at the end of the day whether I think I have earned my wages or not. Men are said to be partial judges of themselves. Young men may be, I doubt if old men are Life seems terribly foreshortened as they look back, and the mountain they set themselves to climb in youth turns out to be a mere spur of immeasurably higher ranges when, with failing breath, they reach the top But if I may speak of the objects I have had more or less definitely in view since I began the ascent of my hillock, they are briefly these. To promote the increase of natural knowledge and to forward the application of scientific methods of investigation to all the problems of life to the best of my ability, in the conviction which has grown with my growth and strengthened with my strength, that there is no alleviation for the sufferings of mankind except veracity of thought and of action, and the resolute facing of the world as it is when the garment of make-believe by which pious hands have hidden its ugher features is stimped off.

It is with this intent that I have subordinated any reasonable, or unreasonable, ambition for scientific fame which I may have permitted myself to entertain to other ends, to the popularisation of science, to the development and organisation of scientific education, to the endless series of battles and skirmishes over evolution—and to untiring opposition to that ecclesiastical spirit, that

clericalism, which in England, as everywhere else, and to whatever denomination it may belong, is the deadly enemy of science

In striving for the attainment of these objects, I have been but one among many, and I shall be well content to be remembered, or even not remembered as such. Chrcumstances, among which I am proud to reckon the devoted kindness of many friends, have led to my occupation of various prominent positions, among which the Presidency of the Royal Society is the highest. It would be mock modesty on my part, with these and other scientific honours which have been bestowed upon me, to pretend that I have not succeeded in the career which I have followed tather because I was driven into it than of my own free will, but I am afiaid I should not count even these things as marks of success if I could not hope that I had somewhat helped that movement of opinion which has been called the New Reformation.

# ON THE ADVISABLENESS OF IMPROVING NATURAL KNOWLEDGE

[1866]

This time two hundred years ago — in the beginning of January, 1666—those of our fore-fathers who inhabited this great and ancient city, took breath between the shocks of two fearful calamities one not quite past, although its fury had abated, the other to come.

Within a few yards of the very spot on which we are assembled, so the tradition runs, that painful and deadly malady, the plague, appeared in the latter months of 1664, and, though no new visitor, smote the people of England, and especially of her capital, with a violence unknown before, in the course of the following year. The hand of a master has pictured what happened in those dismal months and in that truest of fictions, "The History of the Plague Year.' Defoe shows

death, with every accompaniment of pain, and terror, stalking through the narrow streets of old London, and changing their busy hum into a silence broken only by the wailing of the mourners of fifty thousand dead, by the woful denunciations and mad prayers of fanatics, and by the madder yells of despairing profligates

But, about this time in 1666, the death-rate had sunk to nearly its ordinary amount; a case of plague occurred only here and there and the richer citizens who had flown from the pest had returned to their dwellings. The remnant of the people began to toil at the accustomed round of duty, or of pleasure, and the stream of city life bid fair to flow back along its old bed with renewed and uninterrupted vigour

The newly-kindled hope was deceitful. The great plague, indeed, returned no more, but what it had done for the Londoners, the great fire, which broke out in the autumn of 1666, did for London, and, in September of that year, a heap of ashes and the indestructible energy of the people were all that remained of the glory of five-sixths of the city within the walls

Our forefathers had their own ways of accounting for each of these calamities. They submitted to the plague in humility and in penitence, for they believed it to be the judgment of God. But, towards the fire they were furiously indignant,

Interpreting it as the effect of the malice of man,—as the work of the Republicans or of the Papists, according as their prepossessions can infavour of loyalty or of Puritanism.

It would, I tancy have faced but ill with one who, standing where I now stand, in what was then a thickly-peopled and fashionable part of London should have broached to our ancestors the doctrine which I now propound to you—that all their hypotheses were abke wrong, that the plague was no more, in their sense Divine judgment, than the fire was the work of any political, or of any religious, sect, but that they were themselves the authors of both plague and fire, and that they must look to themselves to prevent the recurrence of calamines, to all appearance so peculiarly beyond the reach of human control—so evidently the result of the wiath of God or of the craft and subtlety of an enemy.

And one may picture to one's self how harmoniously the holy cursing of the Puritan of that day would have chimed in with the unholy cursing and the crackling wit of the Rochesters and Sedleys and with the revilings of the political fanatics, if my imaginary plant dealer had gone on to say that, if the return of such inistortunes were ever rendered impossible, it would not be in virtue of the victory of the faith of Laud, or of that of Milton, and, as hittle, by the triumph of republicanism, as by that of monarchy. But that

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the one thing necdful for compassing this end was, that the people of England should second the efforts of an insignificant corporation, the establishment of which a few years before the cpoch of the great plague and the great fire, had been as little noticed, as they were conspicuous

Some twenty years before the outbreak of the plague a few calm and thoughtful students banded themselves together for the purpose, as they phrased it of "improving natural knowledge". The ends they proposed to attain cannot be stated more clearly than in the words of one of the founders of the organisation —

"Our business was (precluding matters of theology and state affairs) to discourse and consider of philosophical enquiries, and such as related thereunto - as Physick, Anatomy, Geometry, Astronomy, Navigation, Staticks, Magneticks, Chymicks, Mechanicks, and Natural Experiments, with the state of these studies and then cultivatim at home and abroad We then discoursed of the cuculation of the blood, the valves in the veins, the venæ lacteæ, the lyinphatic vessels, the Copernical hypothesis, the nature of conjets and new stars, the satellites of Jupiter, the oval shape (as it then appeared) of Saturn, the spots on the sun and its turning on its own axis, the inequalities and selenography of the moon, the several phases of Venus and Mercury, the imí

provement of telescopes and grinding of glasses for that purpose, the weight of air, the possibility or impossibility of vacuties and nature's abhorrence thereof, the Tourcellian experiment in quicksilver the descent of heavy bodies and the degree of acceleration therein, with divers other things of like nature, some of which were then but new discoveries, and others not so generally known and embraced as now they are; with other things appearaning to what hath been called the New Philosophy which from the times of Galileo at Florence, and Su Francis Bacon (Lord Verulam) in England hath been much cultivated in Italy France, Germany, and other parts abroad, as well as with us in England.

The learned Dr Wallis, writing in 1696, narrates in these words, what happened half a century before or about 1645. The associates met at Oxford, in the rooms of Dr Wilkins, who was destined to become a bishop; and subsequently coming together in London, they attracted the notice of the king. And it is a strange evidence of the tast, for knowledge which the most obviously worthless of the Stuarts shared with his father and grandfather, that Charles the Second was not content with saving withy things about his philosophers, but did wise things with regard to them. For he not only bestowed upon them such attention as he could spare from his poodles and his mistresses, but,

being in his usual state of impedantosity, begged for them of the Duke of Ormond, and, that step being without effect, gave them Chelsea College, a charter, and a mace crowning his tayours in the best way they could be crowned, by burdening them no further with royal patronage or state interference

Thus it was that the half-dozen young men, studious of the "New Philosophy" who met in one another's lodgings in Oxford or in London, in the middle of the seventeenth century, grew in numerical and in real strength, until in its latter part, the 'Royal Society for the Improvement of Natural Knowledge" had alreally become famous, and had acquired a claim upon the venciation of Englishmen, which it has ever since retained, as the principal focus of scientific activity in our islands, and the chief champion of the cause it was formed to support

It was by the aid of the Royal Society that Newton published his "Principia" If all the books in the world, except the 'Philosophical Transactions" were destroyed, it is safe to say that the foundations of physical science would remain unshaken, and that the vast intellectual progress of the last two centuries would be largely though incompletely, recorded. Nor have any signs of halting or of decrepitude manifested themselves in our own times. As in Di. Wallis's days, so in these, "our business is, precluding theology and

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state affairs, to discourse and consider of philosophical enquiries. But our "Mathematick" is one which Newton would have to go to school to learn, our "Staticks, Mechanicks, Magneticks, Chymicks, and Natural Experiments" constitute a mass of physical and chemical knowledge, a glumpse at which would compensate Galileo for the doings of a score of inquisitorial cardinals, our "Physick" and "Anntomy have embraced such infinite varieties of being have laid open such new worlds in time and space, have grappled, not unsuccessfully, with such complex problems, that the eyes of Vesalius and of Harvey might be dazzled by the sight of the tree that has grown out of their grain of mustard seed

The fact is perhaps rather too much, than too little, forced upon one's notice, nowadays, that all this marvellous intellectual growth has a no less wonderful expression in practical life, and that, in this respect, if in no other, the movement symbolised by the progress of the Royal Society stands without a parallel in the history of mankind

A series of volumes as bulky as the "Transactions of the Royal Society" might possibly be filled with the subtle speculations of the Schoolmen, not improbably, the obtaining a mastery over the products of mediæval thought might necessitate an even greater expenditure of time and of energy than the acquirement of the 'New Philosophy,'

but though such work engrossed the best intellects of Europe for a longer time than has elapsed since the great fire, its effects were "writ in water, so far as our social state is concerned

On the other hand, if the noble first President of the Royal Society could revisit the upper air and once more gladden his eyes with a sight of the familiar mace, he would find himself in the midst of a material civilisation more different from that of his day, than that of the seventeenth was from that of the first century. And if Lord Brouncker's native sagacity had not deserted his ghost, he would need no long acflection to discover that all these great slups, these radways, these telegraphs, these factories, these printing-presses, without which the whole tabric of modern English society would collapse into a mass of stagment and starving pauperism -that all these pillars of our State are but the ripples and the bubbles upon the surface of that great spurtual stream, the springs of which only, he and his fellows were mivileged to see and seeing, to recognise as that which it behaved them above all things to keep pure and undefiled

It may not be too great a flight of imagination to conceive our noble "evenunt not forgetful of the great troubles of his own day and anxious to know how often London had been burned down since his time, and how often the plague had carried off its thousands. He would have to learn that,

although London contains tenfold the inflamm ible matter that it did in 1666, though, not content with filling our rooms with woodwork and light dranenes, we must needs lead inflammable and explosive gases into every corner of our streets and houses, we never allow even a street to burn And if he asked how this had come about, we should have to explain that the improvement of natural knowledge has furnished us with dozens of machines for throwing water upon files, any one of which would have furnished the ingenious Mr Hooke, the first "curator and experimenter" of the Royal Society, with ample materials for discourse before half a dozen meetings of that body, and that, to say truth, except for the progress of natural knowledge, we should not have been able to make even the tools by which these machines are constructed And, further, it would be necessary to add, that although severe fires sometimes occur and inflict great damage, the loss is very generally compensated by societies, the operations of which have been rendered possible only by the progress of natural knowledge in the direction of mathematics, and the accumulation of wealth in virtue of other natural knowledge

But the plague? My Lord Brouncker's observation would not, I fear, lead him to think that Englishmen of the nineteenth century are purer in life, or more fervent in religious faith, than the

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generation which could produce a Boyle, an Evelyn, and a Milton. He might find the mud of society at the bottom instead of at the top, but I fear that the sum total would be as deserving of swift judgment as at the time of the Restoration. And it would be our duty to explain once more, and this time not without shame, that we have no reason to believe that it is the improvement of our faith, nor that of our morals which keeps the plague from our city; but, again, that it is the improvement of our natural knowledge.

We have learned that pestilences will only take up their abode among those who have prepared unswept and ungarmshed residences for them Then cities must have narrow, unwatered streets, foul with accumulated garbage. Their houses must be ill-drained, ill-lighted, ill-ventilated. Then subjects must be ill-washed, ill-fed, ill-The London of 1665 was such a city clothed The cities of the East, where plague has an enduring dwelling, are such cities. We in later times, have learned somewhat of Nature, and partly obey her. Because of this partial improvement of our natural knowledge and of that tractional obedience, we have no plague, because that knowledge is still very imperfect and that obedience yet incomplete, typhoid is our companion and cholera our visitor. But it is not presumptuous to express the belief that, when our knowledge is

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more complete and our chedience the expression of our knowledge London will count her centuries of freedom from typhoid and cholers, as she now gratefully reckons her two hundred years of ignorance of that plague which swooped upon her thrice in the first half of the seventeenth century

Surely, there is nothing in these explanations which is not fully borne out by the facts? Surely, the principles involved in them are now admitted among the fixed beliefs of all thinking men? Surely, it is true that our countrymen are less subject to fire, famine, pestilence, and all the cvils which result from a want of command over and due anticipation of the course of Nature, than were the countrymen of Milton, and health, wealth, and well-being are more abundant with us than with them . But no less containly is the difference due to the improvement of our knowledge of Nature, and the extent to which that improved knowledge has been incorporated with the household words of men, and has supplied the springs of their daily actions

Granting for a moment, then, the truth of that which the depreciators of natural knowledge are so find of uiging, that its improvement can only add to the resources of our material civilisation; admitting it to be possible that the founders of the Royal Society themselves looked for no other reward than this, I cannot confess that I was

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guilty of exaggeration when I limited, that to him who had the gift of distinguishing between prominent events and important events, the origin of a combined effort on the part of mankind to improve natural knowledge might have loomed larger than the Plague and have outshone the glare of the Fire, as a something fraught with a wealth of beneficence to mankind, in comparison with which the damage done by those ghastly evils would shrink into insignificance

It is very certain that for every victim slain by the plague hundreds of mankind exist and find a fair share of happiness in the world by the aid of the spinning jenny. And the great fire, at its worst, could not have burned the supply of coal, the daily working of which, in the bowels of the carth, made possible by the steam pump, gives rise to an amount of wealth to which the millions lost in old London are but as an old song

But spinning jenny and steam pump are after all, but toys, possessing an accidental value, and natural knowledge creates multitudes of more subtle contrivances, the praises of which do not happen to be sung because they are not directly convertible into instruments for creating wealth. When I contemplate natural knowledge squandering such gifts among men, the only appropriate comparison I can find for her is, to liken her to such

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a persant woman as one sees in the Alps striding ever upward, heavily burdened, and with mind bent only on her home, but yet without effort and without thought knitting for her children. Now stockings are good and comfortable things, and the children will undoubtedly be much the better for them, but surely it would be short-sighted, to say the least of it, to depreciate this toiling mother as a mere stocking-machine—a mere provider of physical conforts?

However, there are blind leaders of the blind, and not a few of them, who take this view of natural knowledge, and can see nothing in the bountiful mother of humanity but a sort of comfort-grinding machine. According to them, the improvement of natural knowledge always has been and always must be, synonymous with no more than the improvement of the material resources and the increase of the gratifications of men.

Natural knowledge is, in their eyes, no real mother of mankind, bringing them up with kindness, and, if need be, with stormess, in the way they should go, and instructing them in all things needful for their welfare, but a sort of farry god-mother, ready to furnish her pets with shoes of swiftness, swords of sharpness, and omnipotent Aladdin's lamps, so that they may have telegraphs to Saturn, and see the other side of the moon, and thank God they are better than their benighted ancestors

If this talk were true I, for one, should not greatly care to toil in the service of natural knowledge. I think I would just as soon be quietly chipping my own finit axe, after the manner of my forefathers a few thousand years back, as be troubled with the endless malady of thought which now intests us all, for such neward. But I venture to say that such views are contrary alike to reason and to fact. Those who discourse in such fashion seem to me to be so intent upon trying to see what is above Nature, or what is behind her, that they are blind to what stares them in the face in her

I should not venture to speak thus strongly if my metatroation were not to be found in the sumplest and most obvious facts,-if it needed more than an appeal to the most actorious truths to justify my assertion, that the improvement of natural knowledge, whatever direction it has taken, and however low the mins of those who may have commenced it-has not only conferred practical benefits on men, but, in so doing, has effected a revolution in their conceptions of the universe and of themselves, and has profoundly altered their modes of thinking and their views of right and I say that natural knowledge, seeking to satisfy natural wants, has found the ideas which can alone still spiritual cravings I say that natural knowledge, in desiring to ascertain the laws of comfort, has been driven to discover those

of conduct, and to lay the foundations of a new morality

Let us take these points separately; and first, what great ideas has natural knowledge introduced into men's minds?

I cannot but think that the foundations of all natural knowledge were laid when the reason of man first came face to face with the facts of Nature, when the savage first learned that the fingers of one hand are fewer than those of both, that it is shorter to cross a stream than to head it. that a stone stops where it is unless it be moved, and that it drops from the hand which lets it go. that light and heat come and go with the sun, that sticks burn away in a fire, that plants and animals grow and die, that if he struck his fellow savage a blow he would make him angry, and perhaps get a blow in return, while if he offered him a fruit he would please him, and perhaps receive a fish in exchange When men had acquired this much knowledge, the outlines. rude though they were, of mathematics, of physics, of chemistry, of biology, of moral, economical, and political science, were sketched Nor did the germ of religion fail when science began to bud. Listen to words which, though new, are yet three thousand years old —

" When in heaven the stars about the moon Look heautiful, when all the winds are laid, And every height comes out, and jurting peak And valley, and the immeasurable heavens Break open to their highest, and all the star-Shine and the shepherd gladders in his neart. '1

If the half savage Greek could share our feelings thus far, it is mational to doubt that he went further, to find as we do, that upon that brief gladness there follows a certain sorrow,—the little light of awakened human intelligence shines so mere a spark amulst the abyss of the unknown and unknowable, seems so insufficient to do more than illuminate the imperfections that cannot be remedied the aspirations that cannot be realised, of man's own nature. But in this sadness, this consciousness of the limitation of man, this sense of an open secret which he cannot penetrate, hes the essence of all religion, and the attempt to embody it in the forms furnished by the intellect is the origin of the higher theologies

Thus it seems impossible to imagine but that the foundations of all knowledge—secular or sacred—were laid when intelligence dawned though the superstructure remained for long ages so slight and feeble as to be compatible with the existence of almost any general view respecting the mode of governance of the universe. No doubt, from the first, there were certain phænomena which, to the rudest mind, presented a

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<sup>&</sup>lt;sup>1</sup> Need it be sord that this is Tennyson's English for Homer's Greek?

constancy of occurrence, and suggested that a fixed order ruled, at any rate, among them. I doubt if the grossest of Fetish worshippers ever imagined that a stone must have a god within it to make it fall, or that a fruit had a god within it to make it taste sweet. With regard to such matters as these, it is hardly questionable that manking from the first took strictly positive and scientific views.

But, with respect to all the less familiar occurrences which present themselves, uncultured man, no doubt, has always taken himself as the standard of companison, as the centre and measure of the world, nor could be well avoid doing so And finding that his apparently uncaused will has a powerful effect in giving use to many occurrences, he naturally enough ascubed other and greater events to other and greater volutions, and came to look upon the world and all that therem is, as the product of the volitions of persons like himself, but stronger, and capable of being appeased or angered, as he himself might be soothed or irritated Through such conceptions of the plan and working of the universe all mankind have passed, or are passing. And we may now consider what has been the effect of the improvement of natural knowledge on the views of men who have reached this stage, and who have begun to cultivate natural knowledge with no desire but that of "mcreasing God's honour and bettering mun's estate"

For example, what could seem wiser, from a mere material point of view more innocent, from a theological one, to an ancient people, than that they should learn the exact succession of the seasons, as wainings for their husbandmen. or the position of the stars, as guides to their rude navigators? But what has grown out of this search for natural knowledge of so merely useful a character? You all know the reply. Astronomy,-which of all sciences has filled men's minds with general ideas of a character most foreign to their daily experience, and has, more than any other rendered it impossible for them to accept the beliefs of their tathers. Astronomy, --- which tells them that this so vast and seemingly solid earth is but an atom among atoms, whirling, no man knows whither, through illimitable space, which demonstrates that what we call the peaceful heaven above us, is but that space, filled by an infinitely subtle matter whose particles are seething and suiging, like the waves of an angry sea, which opens up to us infinite regions where nothing is known, or ever seems to have been known, but matter and force, operating according to rigid rules, which leads us to contemplate phænomena the very nature of which demonstrates that they must have had a beginning, and that they must have an end, but the very nature of which also proves that the beginning was, to our conceptions of time, infinitely remote, and that the end is as immeasurably distant

But it is not alone those who puisue astronomy who ask tor bread and receive ideas. What more harmless than the attempt to lift and distribute water by pumping it, what more absolutely and grossly utilitarian? Yet out of pumps grew the discussions about Nature's abhorrence of a vacuum, and then it was discovered that Natine does not abhor a vacuum, but that air has weight, and that notion paved the way for the doctrine that all matter has weight, and that the force which produces weight is co-extensive with the universe,--in short, to the theory of universal gravitation and endless force While learning how to handle gases led to the discovery of oxygen, and to modern chemistry, and to the notion of the indestructibility of matter

Again, what simpler, or more absolutely practical, than the attempt to keep the axle of a wheel from heating when the wheel turns round very fast? How useful for carters and gig drivers to know something about this, and how good were it, if any ingenious person would find out the cause of such phænomena and thence educe a general remedy for them. Such an ingenious person was Count Rumford; and he and his successors have landed us in the theory of the persistence, or indestructibility, of force. And in the infinitely minute, as in the infinitely great,

which seem never to be intringed

And how has it fured with 'Physick" and Austoray ! Have the anatomist the physiologist, or the physician, whose business it has been to devote themselves assiduously to that emmenily mactical and direct end the alleviation of the sufterings of mankind,-have they been able to confine their vision more absolutely to the strictly I fear they are the worst offenders of For it the astronomer has set before us the infinite magnitude of space and the practical eternity of the duration of the universe, if the physical and chemical philosophers have denionstrated the infinite minuteness of its constituent parts, and the practical eternity of matter and or force and if both have alike proclaimed the muversality of a definite and predicable order and succession of events, the workers in biology have not only accepted all these, but have added more startling theses of then own For, as the astronomers discover in the earth no centre of the universe, but an eccenture speck, so the naturalists find man to be no centre of the hving world but one amidst endless modifications of life, and as the astronomer observes the mark of practically endless time set upon the arrangements of the solar system so the student of life finds the records of ancient forms of existence peopling the world for ages, which, in relation to human experience, are infinite

Furthermore, the physiologist finds life to be as dependent for its manifestation on particular molecular arrangements as any physical or chemical phenomenon, and wherever he extends his researches, fixed order and unchanging causation reveal themselves, as plainly as in the rest of Nature

Nor can I find that any other fate has awaited the germ of Religion Ausing, like all other kinds of knowledge, out of the action and interaction of man's mind with that which is not man's mind, it has taken the intellectual coverings of Fetishism or Polytheism of Theism or Atheism, of Superstition of Rationalism With these and their relative metits and dements, I have nothing to do, but this it is needful for my purpose to say that if the religion of the present differs from that of the past, it is because the theology of the present has become more scientific than that of the past, because it has not only renounced idols of wood and idols of stone, but begins to see the necessity of breaking in pieces the idols built up of books and traditions and fine-spun ecclesiastical cobwebs and of cherishing the noblest and most human of man's emotions, by worship "for the most part of the silent sort" at the altar of the Unknown

Such are a few of the new conceptions implanted

in our minds by the improvement of natural knowledge Men have acquired the ideas of the practically infinite extent of the universe and of its practical eternity, they are familiar with the conception that our earth is but an infinitesimal fragment of that part of the universe which can be seen, and that, nevertheless, its dination is as compared with our standards of time, infinite They have further acquired the idea that man is but on 2 of innumerable forms of life now existing on the globe, and that the present existences are but the last of an immeasurable series of predecessors Moreover, every step they have made in natural knowledge has tended to extend and rivet in their minds the conception of a definite order of the universe -which is embodied in what are called, by an unhappy metaphor the laws of Nature-and to narrow the range and loosen the force of men's belief in spontaneity, or in changes other than such as ause out of that definite order itself

Whother these ideas are well or ill founded is not the question. No one can deny that they exist, and have been the inevitable outgrowth of the improvement of natural knowledge. And if so, it cannot be doubted that they are changing the form of men's most cherished and most important convictions.

And as regards the second point—the extent to which the improvement of natural knowledge has,



remodelled and altered what may be termed the intellectual ethics of men,—what are among the moral convictions most fondly held by barbarous and semi-barbarous people.

They are the convictions that authority is the soundest basis of belief, that ment attaches to a readmess to believe, that the doubting disposition is a bad one, and scepticism a sin, that when good authority has pronounced what is to be believed, and faith has accepted it, reason has no further duty. There are many excellent persons who yet hold by these principles, and it is not my present business, or intention, to discuss their views. All I wish to bring clearly before your minds is the unquestionable fact, that the improvement of natural knowledge is effected by methods which directly give the he to all these convictions, and assume the exact reverse of each to be time

The improver of natural knowledge absolutely refuses to acknowledge authority, as such. For him, scepticism is the highest of duties, blind faith the one unpaidonable sin. And it cannot be otherwise, for every great advance in natural knowledge has involved the absolute rejection of authority, the cherishing of the keenest scepticism, the annihilation of the spirit of blind faith, and the most ardent votary of science holds his firmest convictions, not because the men he most venerates hold them, not because their verity is testined by portents and wonders, but because his experi-

ence teaches him that whenever he chooses to bring these convictious into contact with their primary source. Nature—whenever he thinks fit to test them by appealing to experiment and to observation—Nature will confirm them. The man of science has learned to believe in justification, not by faith, but by verification.

Thus, without for a moment pretending to despise the practical results of the improvement of natural knowledge, and its beneficial influence on material civilisation, it must I think, be admitted that the great ideas, some of which I have indicated and the ethical spirit which I have endeavoured to sketch, in the few moments which remained at my disposal constitute the real and permanent significance of natural knowledge

If these ideas be destined, as I believe they are, to be more and more firmly established as the world grows older, it that spirit be fated, as I believe it is, to extend itself into all departments of human thought, and to become co-extensive with the range of knowledge, if, as our race approaches its maturity it discovers, as I believe it will, that there is but one kind of knowledge and but one method of acquiring it, then we, who are still children, may justly feel it our highest duty to recognise the advisableness of improving natural knowledge, and so to aid ourselves and our successors in our course towards the noble goal which hes before mankind

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## THE PROGRESS OF SCIENCE

1837 - 1887

[1887]

THE most obvious and the most distinctive feature of the History of Civilisation, during the last fifty years, is the wonderful increase of industrial production by the application of machinery, the improvement of old technical processes and the invention of new ones, accompanied by an even more remarkable development of old and new means of locomotion and intercommunication By this rapid and vast multiplication of the commodities and conveniences of existence, the general standard of comfort has been raised the ravages of pestilence and famme have been checked, and the natural obstacles, which time and space offer to mutual intercourse, have been reduced in a manner, and to an extent, unknown to former The diminution or removal of local ignorand prejudice, the creation of common

interests among the most widely separated peoples, and the strengthening of the forces of the organisation of the commonwealth against those of political or social anarchy, thus effected, have exerted an influence on the present and future fortunes of mankind the full significance of which may be divined, but cannot, as yet, be estimated at its full value

This revolution—for it is nothing less—in the political and social aspects of modern civilisation has been preceded, accompanied, and in great measure caused, by a less obvious, but no less marvellous, increase of natural knowledge and especially of that part of it which is known as Physical Science, in consequence of the application of scientific method to the investigation of the phenomena of the material world. Not that the growth of physical science is an exclusive prerogative of the Victorian age. Its present strength and volume merely indicate the highest level of a stream which took its rise alongside of the primal founts of Philosophy, Literature, and Art, in ancient Greece, and, after being danimed up for a thousand years, once more began to flow three centuries ago

It may be doubted if even-handed justice, as free from fulsome panegyric as from captious depreciation, has ever yet been dealt out to the sages of antiquity who, for eight centuries, from the time of Thales to that of Galen, toiled at the

foundations of physical science But, without entering into the discussion of that large question, it is certain that the labours of these early workers in the field of natural knowledge were brought to a standstill by the decay and disruption of the Roman Empire, the consequent disorganisation of society, and the diversion of men's thoughts from sublunary matters to the problems of the supernatural world suggested by Christian dogina in the Middle Ages. And, notwithstanding sporadic attempts to recall men to the investigation of nature, here and there, it was not until the fifteenth and sixteenth centuries that physical science made a new start founding itself, at first, altogether upon that which had been done by the Greeks. Indeed, it must be admitted that the men of the Renaissance, though standing on the shoulders of the old philosophers, were a long time before they saw as much as their forerunners had done.

The first serious attempts to carry further the unfinished work of Archimedes, Hipparchus, and Ptolemy, of Aristotle and of Galen, naturally enough arose among the astronomers and the physicians. For the imperious necessity of seeking some remedy for the physical ills of life had insured the preservation of more or less of the wisdom of Hippocrates and his successors, and, by a happy conjunction of circumstances, the Jewish and the Arabian physicians and philo-

sophers escaped many of the influences which, at that time, blighted natural knowledge in the Christian world On the other hand, the superstitious hopes and fears which afforded countenance to astrology and to alchemy also sheltered astronomy and the germs of chemistry Whether for this, or for some better reason, the founders of the schools of the Middle Ages included astronomy, along with geometry, arithmetic, and music, as one of the four branches of advanced education, and, in this respect, it is only just to them to observe that they were far in advance of those who sit in their seats The schoolmen considered no one to be properly educated unless he were acquainted with, at any rate, one branch of physical science We have not, even yet, reached that stage of enlightenment In the early decades of the seventeenth century, the men of the Renaissance could show that they had already put out to good interest the treasure bequeathed to them by the Greeks They had produced the astronomical system of Copernicus, with Kepler's great additions, the astronomical discoveries and the physical investigations of Galileo; the mechanics of Stevinus and the "De Magnete" of Gilbert, the anatomy of the great French and Italian schools and the physiology of Harvey In Italy, which had succeeded Greece

in the hegemony of the scientific world, the Accademia dei Lyncei and sundry other such

associations for the investigation of native, the models of all subsequent academics and scientific societies, had been founded, while the literary skill and biting wit of Galileo had made the great scientific questions of the day not only intelligible, but attractive to the general public

In our own country. Francis Bacon had essayed to sum up the past of physical science, and to indicate the path which it must follow if its great destines were to be fulfilled. And though the attempt was just such a magnificent farlure as might have been expected from a man of great endowments, who was so singularly devoid of scientific insight that he could not understand the value of the work already achieved by the true instaurators of physical science, yet the majestic eloquence and the fervid varietisations of one who was conspicuous alike by the greatness of his rise and the depth of his fall, drew the attention of all the world to the 'new birth of Time

But it is not easy to discover satisfactory evidence that the "Novum Organum" had any direct beneficial influence on the advancement of natural knowledge. No delusion is greater than the notion that method and industry can make up for lack of motherwit, either in science of in practical life, and it is strange that, with his knowledge of mankind, Bacon should have dreamed that his, or any other, "via inveniendi scientias" would "level men's wits" and leave

little scope for that inborn capacity which is called genius. As a matter of fact, Bacon's "via" has proved hopelessly impracticable, while the "anticipation of nature" by the invention of hypotheses based on incomplete inductions, which he specially condemns, has proved itself to be a most efficient indeed an indispensable instrument of scientific progress. Finally, that transcendental alchemy—the superinducement of new forms on matter—which Bacon declares to be the supreme aim of science has been wholly ignored by those who have created the physical knowledge of the present day.

Even the eloquent advocacy of the Chancellor brought no unmixed good to physical science. It was natural enough that the man who, in his better moments, took "all knowledge for his patrimony," but, in his worse, sold that buthright for the mess of pottage of Court favour and professional success, for pomp and show, should be led to attach an undue value to the practical advantages which he foresaw as Roger Bacon and, indeed Seneca had foreseen, long before his tune, must follow in the train of the advancement of natural knowledge The burden of Bacon's pleadings for science is the "gathering of fruit '-the importance of wanning solul material advantages by the investigation of Nature and the desirableness of limiting the application of scientific methods of mamny to that field

Bacon's younger contemporary, Hobbes, casting aside the prudent reserve of his predecessor in regard to those matters about which the Crown or the Church might have something to say, extended scientific methods of inquiry to the phenomena of mind and the problems of social organisation, while, at the same time, be indicated the boundary between the province of real, and that of imaginary, knowledge The "Principles of Plulosophy" and the "Leviathan" embody a coherent system of purely scientific thought in language which is a model of clear and vigorous English At the same time, in France, a man of far greater scientific canacity than either Bacon or Hobbes, René Descartes, not only in his immortal "Discours de la Méthode" and elsewhere, went, down to the foundations of scientific certainty, but, in his "Principes de Philosophie," indicated where the goal of physical science really lay Descartes was an emment mathematician, and it would seem that the bent of his mind led him to overestimate the value of deductive reasoning from general principles, as much as Bacon had under-estimated it The progress σ£ physical science has been effected neither Baconians nor by Cartesians, as such, but by men like Galileo and Harvey Newton, who would have done their work just as well if neither Bacon nor Descartes had ever propounded their views respecting the

manner in which scientific investigation should be pursued

The progress of science, during the first century after Bacon's death, by no means verified his saugume prediction of the fruits which it would For, though the revived and renewed study of nature had spread and grown to an extent which surpassed reasonable expectation, the practical results—the "good to men's estate"—were, at first, by no means apparent Sixty years after Bacon's death Newton had crowned the long labours of the astronomers and the physicists, by co-ordinating the phenomena of inclar motion throughout the visible universe into one vast system, but the "Principia" helped no man to either wealth or comfort Descartes, Newton, and Leibnitz had opened up new worlds to the mathematician but the acquisitions of their genius enriched only man's ideal estate. Descartes had laid the foundations of rational cosmogony and of physiological psychology, Boyle had produced models of experimentation in various branches of physics and chemistry, Pascal and Torricelli had weighed the an, Malpighi and Grew, Ray and Willoughby had done work of no less importance in the biological sciences, but weaving and spinning were carried on with the old appliances, nobody could travel faster by sea or by land than at any pievious time in the world's history, and King George could send a message from London VOL. T

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to Work no faster than King John might have done. Metals were worked from their ores by immemorial rule of thumb, and the centre of the iron trade of these islands was still among the oak forests of Sussex. The uticost skill of our mechanicians did not get beyond the production of a coarse watch.

The middle of the eighteenth century is illustrated by a host of great names in science-English, French, German, and Italian—especially in the fields of chemistry, geology, and biology, but this deepening and broadening of natural knowledge produced next to no immediate practical benefits. Even if, at this time Francis Bacon could have returned to the scene of his greatness and of his littleness, he must have regarded the philosophic world which praised and disregarded his precepts with great disfavour. If ghosts are consistent, he would have said, "These people are all wasting their time, just as Gilbert and Kepler and Galileo and my worthy physician Huyey did in my day. Where are the finits of the restoration of science which I promised? This accumulation of bare knowledge is all very well, but our bono? Not one of these people is doing what I told him specially to do, and seeking that secret of the cause of forms which will enable men to deal, at will, with matter, and superinduce new natures upon the old foundations."

But, a little later, that growth of knowledge beyond imaginable utilitarian ends, which is the condition pieredent of its piactical utility, began to produce some effect upon practical life, and the operation of that part of nature we call human upon the rest began to create, not "new natures," in Bacon's sense, but a new Nature the existence of which is dependent upon men's efforts, which is subservient to their wants, and which would disappear if man's shaping and guiding hand were Every mechanical artifice, every withdiann chemically pure substance employed in manufacture, every abnormally fertile race of plants, or rapidly growing and fattening breed of animals, is a part of the new Nature created by science Without it the most densely populated regions of modern Europe and America must retain their primitive, sparsely inhabited, agricultural pastoral condition, it is the foundation of our wealth and the condition of our safety from submergence by another flood of barbarous hordes. it is the bond which unites into a solid political whole, regions larger than any empire of autiquity, it secures us from the recurrence of the pestilences and famines of former times; it is the source of endless comforts and conveniences, which are not mere luxures, but conduce to physical and moral well-being. During the last fifty years, this new birth of time, this new Nature begotten by science upon fact, has pressed itself duity and hourly upon our attention, and has worked mitacles which have modified the whole fashion of our lives

What wonder, then, if these astonishing fruits of the tree of knowledge are too often regarded by both friends and enemies as the be-all and end-all of science? What wonder if some eulogise, and others revile, the new philosophy tor its utilitarian ends and its merely material triumphs?

In truth, the new philosophy deserves neither the plaise of its eulogists, nor the blaine of its slanderers As I have pointed out, its disciples were guided by no search after practical fruits, during the great period of its growth, and it reached adolescence without being stimulated by any rewards of that nature. The bare enumeration of the names of the men who were the great lights of science in the latter part of the eighteenth and the first decade of the unetcenth century, of Herschel, of Laplace, of Young, of Fresnel, of Oeisted, of Cavendish, of Lavoisies, of Davy, of Lamarck of Cuvier, of Jussieu, of Decandolle, of Werner and of Hutton, suffices to indicate the strength of physical science in the age immediately preceding that of which I have to treat But of which of these great men can it be said that their labours were directed to practical ends? I do not call to mind even an invention of practical utility which we owe to any of them, except the safety-lamp of Davy Weiner certainly paid attention to mining, and I have not forgotten

James Watt But, though some of the most important of the improvements by which Watt converted the steam-engine, invented long before his time, into the obedient slave of man, were suggested and guided by his acquaintance with scientific principles, his skill as a practical mechanician and the efficiency of Bolton's workmen had quite as much to do with the realisation of his projects

In fact, the history of physical science teaches (and we cannot too carefully take the lesson to heart) that the practical advantages, attainable through its agency, never have been, and never will be, sufficiently attractive to men inspired by the inborn genius of the interpreter of Nature, to give them courage to undergo the toils and make the sacrifices which that calling requires from its That which stirs their pulses is the love of knowledge and the joy of the discovery of the causes of things sung by the old poet-the supreme delight of extending the realm of law and order ever farther towards the unattamable goals of the infinitely great and the infinitely small between which our little race of life is run In the course of this work, the physical philosopher, sometimes intentionally, much more often unintentionally, lights upon something which proves to be of practical value. Great is the rejoicing of those who are benefited thereby, and, for the moment, science is the Diana of all the

craftsmen. But even while the circs of jubilation resound and this flotsam and jetsam of the tide of investigation is being turned into the wages of working and the wealth of capitalists, the crest of the wave of scientific investigation is far away on its course over the illimitable ocean of the unknown.

Fin he it from me to depreciate the value of the gitts of science to practical life, or to cast a doubt upon the property of the course of action of those who follow science in the hope of finding wealth alongside truth, or even wealth alone. Such a profession is as respectable as any other. And quite as little do I desue to agnore the fact that, it industry owes a heavy debt to science, it has largely repaid the loan by the unportant aid which it has in its turn, rendered to the advancement of science In considering the causes which hindered the progress of physical knowledge in the schools of Athens and of Alexandria, it has often struck med that where the Greeks did woulders was in just those branches of science, such as geometry, astronomy, and anatomy, which mo susceptible of very considerable development without any, or any but the simplest, appliances It is a curious speculation to think what would have become of modern physical science it glass

I There are excellent remarks to the same effect in Zeller's Philosophic act Grachen, Theil II. Abth. ii. p. 407, and in Bucken's Die Methode der Arastotelischen Forschung, pp. 138 et seg.

and alcohol bad not been easily obtamable and of the gradual perfection of mechanical skill to adustrial ends had not enabled investigators to obtain, at comparatively little cost microscopes, telescopes, and all the exquisitely delicate apparatus for determining weight and measure and for estimating the lapse of time with exactness, which they now command. If science has rendered the colossal development of modern industry possible. beyond a doubt undustry has done no less for modern physics and chemistry, and for a great deal of modern biology And as the captains of industry have, at last, begun to be aware that the condition of success in that waifare, under the forms of peace, which is known as industrial competition, hes in the discipline of the troops and the use of arms of precision, just as much as it does in the warfare which is called war, then demand for that discipline, which is technical education, is reacting upon science in a manner which will, assuredly, stimulate its future growth to an incalculable extent. It has become obvious that the interests of science and of industry are identical, that science cannot make a step forward without sooner or later, opening up new channels for industry; and, on the other hand, that every advance of industry tacilitates those experimental investigations, upon which the growth of science depends We may hope that, at last, the weary misunderstanding between the practical men who

professed to despise science, and the high and dry philosophers who professed to despise practical results, is at an end

Nevertheless, that which is true of the infancy of physical science in the Greek world, that which is true of its adolescence in the seventeenth and eighteenth centuries, remains true of its mper age in these latter days of the uneteenth century The great steps in its progress have been made, are made, and will be made, by men who seek knowledge simply because they crave for it They have their weaknesses, their follies, their vanities, and then uvalries, like the icst of the world; but, whatever by-ends may mur their dignity and impede their usefulness, this chief end redeems them! Nothing great in science has ever been done by men, whatever then powers. in whom the divine afflatus of the truth-seeker was wanting. Men of moderate capacity have

<sup>\*</sup> Preshel, after a bullhant career of discovery in some of the most difficult regions of physico-nathematical science, died at thirty-nine pairs of age. The following passage of a letter from him to Young (written in November, 1824) quoted by Whewell, so aptly illustrates the spirit which animates the scientific inquirer that I may site it.

<sup>&</sup>quot;For a long time that sensibility, or that conity which people call love of glory is much blunted in me. I labour much his to catch the suffrages of the public than to obtain an inward approval which has always been the mental revail of my efforts. Without doubt I have often wanted the spur of vanity to excite me to pursue my rescarches in moments of disput and discouragement. But all the compliments which I have received from MM Arago. De Laphace, or Boot, never gave me so much pleasure as the discovery or a theoretical truth or the confirmation of a calculation by experiment.

done great things because it animated them \_and men of great natural gifts have failed, absolutely or relatively, because they lacked this one thing needful.

To any one who knows the business of investigation practically, Bacon's notion of establishing a company of investigators to work for ' truits," as if the puisuit of knowledge were a kind of mining operation and only required well-directed picks and shovels, seems very strange 1. In science, as in ait, and, as I believe in every other sphere of human activity there may be wisdom in a multitade of counsellors, but it is only in one or two of them. And in scientific inquiry, at any rate, it is to that one or two that we must look for light and guidance. Newton said that he made his discoveries by 'intending" his mind on the subject, no doubt, truly. But to equal his success one must have the mind which be "intended" Forty lessor men night have intended their ninds till they cracked, without any like result. It would be idle either to affirm or to deny that the last half-centmy has produced men of science of the calibre of Newton. It is sufficient that it can show a few capacities of the first rank, competent not only to deal profitably with the inheritance

Memorable exemple de l'impuissance des recherches collectives appliquées à la decouverte des vérités nouvelles!" says one of the most distinguished of hving French sarants, of the corporate chemical work of the old Académie des Sciences (See Bertholot, Source et Philosophie, p. 201)

bequeathed by then scientific forefathers, but to pass on to their successors physical truths of a higher order than any yet reached by the human race. And if they have succeeded as Newton succeeded, it is because they have sought truth as he sought it, with no other object than the finding it.

I am conscious that in undertaking to give even the buefest sketch of the progress of physical science, in all its branches, during the last halicentury. I may be thought to have exhibited more courage than discretion, and perhaps more presumption than either. So far as physical science is concerned, the days of Admirable Crichtons have long been over, and the most indefatigable of haid workers may think he has done well if he has mastered one of its inuior subdivisions theless, it is possible for any one, who has familiarused lumself with the operations of science in one department, to comprehend the significance, and even to form a general estimate of the value, of the achievements of specialists in other departroents

Nor is there any lack either of guidance, or of aids to ignorance. By a happy chance, the first edition of Whewell's "History of the Inductive Sciences" was published in 1837, and it affords a very useful view of the state of things at the commencement of the Victorian epoch. As to subsequent events,

there are numerous excellent summaries of the progress of various branches of science, especially up to 1881, which was the jubilee year of the British Association. And, with respect to the biological sciences, with some parts of which my studies have familiarised inc, my personal experience nearly coincides with the preceding half-century. I may hope, therefore, that my chance of escaping schous errors is as good as that of any one else, who might have been persuaded to undertake the somewhat perilous enterprise in which I find myself engaged

There is yet another profatory remark which it seems desirable I should make. It is that I think it proper to confine invisely to the work done, without saying anything about the does of it. Meddling with questions of ment and priority is a thorny business at the best of times, and, unless in case of necessity, altogether undesirable when one is dealing with contemporaries. No such necessity has upon me, and I shall, therefore, mention no names of living men, lest, perchance, I should men the reproof which the Israelites, who struggled with one another in the field, addressed to Moses—"Who made thee a prince and a judge over us?"

I am particularly indulted to my fixed and colleague, Professor Rucker, F.R.S., for the many acute criticisms and suggestions on my remarks respecting the ultimate problems of physics, with which he has favoured me, and by which I have greatly profited

Physical science is one and indivisible Although, for practical purposes, it is convenient to mark it out into the primary regions of Physics. Chemistry, and Biology, and to subdivide these into subordinate provinces, yet the method of investigation and the ultimate object of the physical inquirer are everywhere the same

The object is the discovery of the rational order which pervades the universe, the method consists of observation and experiment (which is observation under artificial conditions) for the determination of the facts of Nature, of inductive and deductive reasoning for the discovery of their mutual relations and connection The various branches of physical science differ in the extent to which, at any given moment of their history, observation on the one hand, or ratiocination on the other, is their more obvious feature, but in no and nothing can be more incorrect than the assumption one sometimes meets with, that physics has one method, chemistry another, and biology a third

All physical science starts from certain postulates. One of them is the objective existence of a material world. It is assumed that the phenomena which are comprehended under this name have a "substratum" of extended, impenetiable, mobile substance, which exhibits the quality known as inertia, and is termed matter.\(^1\) Another

<sup>&</sup>lt;sup>1</sup> I am aware that this proposition may be challenged. It

postulate is the universality of the law of causation. that nothing happens without a cause (that is, a necessary procedent condition), and that the state of the physical universe, at any given moment, is the consequence of its state at any preceding Another is that any of the rules, or moment so-called "laws of Nature," by which the relation of phenomena is truly defined, is true for all time The validity of these postulates is a problem of metaphysics, they are neither self-evident nor are they, strictly speaking demonstrable justification of their employment, as axioms of physical philosophy, has in the circumstance that expectations logically based upon them are verified, or, at any rate, not contradicted, whenever they can be tested by experience.

Physical science therefore rests on verified or uncontradicted hypotheses; and, such being the case, it is not surprising that a great condition of

may be said for example, that, on the ny pothesis of Boscovich matter has no extension, being teduced to mathematical points serving as centres of "forces". But as the "forces of the various centres are conceived to himit one another's action in such a manner that an area around each centre has an individuality of its own, extension comes back in the term of that area. Again, a very eminent mathematicien and physicist—the late Clerk Maxwell—has declared the impenetrality in not essential to our notions of matter, and that two atoms may concer ably occupy the same space. I am both to dispute any dictum of a philosopher as remarks ble for the subtlety of his intellect as for his vast knowledge, but the assertion that one and the same point or area of space can have different (conceivably opposite) attributes appears to me to violate the principle of contradiction, which is the foundation not only of physical science, but of logic in general. It means that A can be not-A

its progress has been the invention of verifiable hypotheses. It is a favourite popular delusion that the scientific inquirer is under a sort of moral obligation to abstain from going beyond that generalisation of observed facts which is absurdly called 'Baconian' induction. But any one who is practically acquainted with scientific work is aware that those who refuse to go beyond fact, raiely get as far as fact; and any one who has studied the history of science knows that almost every great step therein has been made by the "anticipation of Nature," that is, by the invention of hypotheses, which, though verifiable, often had very little foundation to start with, and, not unfrequently, in spite of a long career of usefulness, turned out to be wholly erroneous in the long run.

The geocentric system of astronomy, with its eccentrics and its epicycles, was an hypothesis utterly at variance with fact, which nevertheless did great things for the advancement of astronomical knowledge. Kepler was the wildest of guessers. Newton's corpuscular theory of light was of much temporary use in optics, though nobody now believes in it, and the undulatory theory, which has superseded the corpuscular theory and has proved one of the most fertile of instruments of research, is based on the hypothesis of the existence of an "ether," the properties of which are defined in propositions,

some of which, to ordinary apprehension, seem physical autinomies

It sounds paradoxical to say that the attainment of scientific truth has been effected, to a great extent, by the help of scientific errors. But the subject-matter of physical science is furnished by observation, which cannot extend beyond the limits of our faculties, while, even within those limits, we cannot be certain that any observation is absolutely exact and exhaustive. Hence it follows that any given generalisation from observation may be true, within the limits of our powers of observation at a given time, and vet turn out to be untrue, when those powers of observation are directly or indirectly enlarged. Or to put the matter in another way, a doctrine which is untrue absolutely, may to a very great extent, be susceptible of an interpretation in accordance with the truth. At a certain period in the history of astronomical science, the assumption that the planets move in cucles was true enough to serve the purpose of correlating such observations as were then possible, after Kepler, the assumption that they move in ellipses became true enough in regard to the state of observational astronomy at that time We say still that the orbits of the planets are ellipses because, for all ordinary purposes, that is a sufficiently near approximation to the truth, but, as a matter of fact, the centre of gravity of a planet describes

neither an clipse nor any other simple curve, but an immensely complicated undulating line. It may fairly be doubted whether any generalisation, or hypothesis based upon physical data is absolutely true in the sense that a mathematical proposition is so, but, if its errors can become apparent only outside the limits of practicable observation, it may be just as usefully adopted for one of the symbols of that algebra by which we interpret Nature, as if it were absolutely true.

The development of every branch of physical knowledge presents three stages, which, in their logical relation, are successive. The first is the determination of the sensible character and order of the phenomena This is Natural History, in the original sense of the term, and here nothing but observation and experiment avail us second is the determination of the constant relations of the phenomena thus defined, and then expression in rules or laws. The third is the explication of these particular laws by deduction from the most general laws of matter and The last two stages constitute Natural motion Philosophy in its original sense. In this region, the invention of verifiable hypotheses is not only permissible, but is one of the conditions of progress

Historically, no branch of science has followed this order of growth, but, from the dawn of exact knowledge to the present day, observation, expenment, and speculation have gone hand in hand and, whenever science has halted or strayed from the right path it has been, either because its votaties have been content with mere unverified or unverifiable speculation (and this is the commonest case, because observation and experiment are hard work, while speculation is amusing); or it has been, because the accumulation of details of observation has for a time excluded speculation.

The progress of physical science, since the revival of learning, is largely due to the fact that men have gradually learned to lay aside the consideration of unvertibable hypotheses; to guide obscivation and experiment by verifiable hypotheses; and to consider the latter, not as ideal truths, the real entities of an intelligible world behind phenomena, but as a symbolical language, by the aid of which Nature can be interpreted in terms apprehensible by our intellects And if physical science, during the last fifty years. has attained dimensions beyond all former precedent, and can exhibit achievements of greater importance than any former such period can show. it is because able men, animated by the true scientific spirit, carefully trained in the method of science, and having at their disposal immensely improved appliances, have devoted themselves to the enlargement of the boundaries of natural knowledge in greater number than during any previous half-century of the world's history

I-have said that our epoch can produce achievements in physical science of greater moment than any other has to show advisedly, and I think that there are three great products of our time which metify the assertion. One of these is that doctrine concerning the constitution of matter which, for went of a better name, I will call "molecular," the second is the doctrine of the conservation of energy, the third is the doctrine Each of these was foreshadowed. ot evolution more or less distinctly, in former periods of the history of science, and so far is either from being the outcome of purely inductive reasoning, that it would be hard to overrate the influence of metaphysical, and even of theological, considerations upon the development of all three. The peculiar ment of our epoch is that it has shown how these hypotheses connect a vast number of seemingly independent partial generalisations, that it his given them that precision of expression which is necessary for their exact verification and that it has practically proved their value as guides to the discovery of new truth. All three doctrines are intimately connected, and each is applicable to the whole physical cosmos. But, as might have been expected from the nature of the case, the first two grew, mainly, out of the consideration of physico-chemical phenomena, while the third. in great measure owes its rehabilitation, if not its origin, to the study of biological phenomena

In the carly decades of this century, a number of important truths applicable, in part, to matter in general, and, in part, to particular forms of matter, had been ascertained by the physicists and chemists

The laws of motion of visible and tangible, or molar, matter had been worked out to a great degree of refinement and embodied in the branches of science known as Mechanics, Hydrostatics, and Preumatics These laws had been shown to hold good, so far as they could be checked by observation and experiment, throughout the universe, on the assumption that all such masses of matter possessed mertia and were susceptible of acquiring motion in two ways, firstly by impact, or impulse from without, and, secondly, by the operation of certain hypothetical causes of motion termed 'forces," which were usually supposed to be resident in the particles of the masses themselves. and to operate at a distance, in such a way as to tend to draw any two such masses together, or to separate them more widely

With respect to the ultimate constitution of these masses, the same two antagonistic opinions which had existed since the time of Democritus and of Aristotle were still face to face. According to the one, matter was discontinuous and consisted of minute indivisible particles or atoms, separated by a universal vacuum. according to the other, it was continuous, and the finest distinguishable, or

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imaginable, particles were scattered through the attenuated general substance of the plenum. A rough analogy to the latter case would be afforded by granules of ice diffused through water, to the former, such granules diffused through absolutely empty space.

In the latter part of the eighteenth century the chemists had arrived at several very important generalisations respecting those properties of matter with which they were especially concerned. However plainly penderable matter scemed to be originated and destroyed in their operations, they proved that, as mass or body, it remained indestructible and ingenerable, and that, so far, it varied only in its perceptibility by our scusce-The course of investigation further proved that a certain number of the chemically separable kinds of matter were unalterable by any known means (except in so far as they might be made to change then state from solid to fluid, or rue versit), unless they were brought into contact with other kinds of matter, and that the properties of these several kinds of matter were always the same, whatever All other bodies were found to their origini. consist of two or more of these, which thus took the place of the four "elements" of the ancient philosophers. Further, it was proved that, in forming chemical compounds, bodies always unite in a definite proportion by weight, or in sample multiples of that proportion, and that, if any one

body were taken as a standard, every other could have a number assigned to it as its proportional combining weight. It was on this foundation of fact that Dalton based his re-establishment of the old atomic hypothesis on a new empirical foundation. It is obvious, that if elementary matter consists of indestructible and indivisible particles, each of which constantly preserves the same weight relatively to all the others, compounds formed by the aggregation of two, three, four or more such particles must exemplify the rule of combination in definite proportions deduced from observation.

In the meanwhile, the gradual reception of the undulatory theory of light necessitated the assumption of the existence of an 'ether' filling all space. But whether this ether was to be regarded as a strictly material and continuous substance, was an undecided point, and hence the revived atomism escaped strangling in its birth. For it is clear, that if the ether is admitted to be a continuous material substance, Democritic atomism is at an end and Cartesian continuity takes its place.

The real value of the new atomic hypothesis, however, did not he in the two points which Democritus and his followers would have considered essential—namely, the indivisibility of the "atoms" and the presence of an interatomic vacuum—but in the assumption that, to the

extent to which our means of analysis take us, material bodies consist of definite minute masses, each of which, so far as physical and chemical processes of division go may be regarded as a unit—having a practically permanent individuality. Just as a man is the unit of sociology without reference to the actual fact of his divisibility, so such a minute mass is the unit of physico-chemical science—that smallest material particle which under any given circumstances acts as a whole 1

The doctrine of specific heat originated in the eighteenth century It means that the same mass of a body, under the same circumstances, always requires the same quantity of heat to raise it to a given temperature, but that equal masses of different bodies require different quantities Ultimately, it was found that the quantities of heat required to raise equal masses of the more perfect gases, through equal ranges of temperature, were inversely proportional to their combining weights Thus a definite relation was established between the hypothetical units and heat—The phenomena of electrolytic decomposition showed that there was a like close relation between these units and electricity. The quantity of electricity generated by the combination of any two units is sufficient to separate any other two which are susceptible of



<sup>1 &</sup>quot;Molecule" would be the more appropriate name for such a particle. Unfortunately, chemists employ this term in a special sense, as a name for an aggregation of their smallest particles, for which they retain the designation of "atoms".

such decomposition. The phenomena of isomorphism showed a relation between the units and crystalline forms, certain units are thus able to replace others in a crystalline body without altering its form, and others are not

Again, the laws of the effect of pressure and heat on gaseous bodies, the fact that they combine in definite proportions by volume, and that such proportion bears a simple relation to their combining weights, all harmonised with the Daltonian hypothesis, and led to the bold speculation known as the law of Avogadio-that all gascous bodies, under the same physical conditions, contain the same number of units In the form in which it was first enunciated, this hypothesis was incorrect -perhaps it is not exactly true in any form, but it is haidly too much to say that chemistry and inolecular physics would never have advanced to their present condition unless it had been assumed to be true. Another mimense service rendered by Dulton, as a corollary of the new atomic doctrine, was the creation of a system of symbolic notation, which not only made the nature of chemical compounds and processes easily intelligible and casy of recollection, but, by its very form suggested new lines of inquiry. The atomic notation was as serviceable to chemistry as the binomial nomenclature and the classificatory schematism of Linnæus were to zoology and botany

Side by side with these advances arose another

which also has a close parallel in the history of biological science If the unit of a compound is made up by the aggregation of elementary units, the notion that these must have some sort of definite arrangement mevitably suggests itself, and such phenomena as double decomposition pointed, not only to the existence of a molecular architecture, but to the possibility of modifying a molecular fabric without destroying it, by taking out some of the component units and replacing them by others The class of neutral salts for example, includes a great number of bodies in many ways similar, in which the basic molecules, or the acid molecules may be replaced by other basic and other acid molecules, without altering the neutrality of the salt; just as a cube of bucks remains a cube, so long as any brick that is taken out is replaced by another of the same shape and dimensions whatever its weight or other properties may be. Facts of this kind gave rise to the conception of "types" of molecular structure, just as the recognition of the unity in diversity of the structure of the species of plants and animals gave rise to the notion of biological "types" notation of chemistry enabled these ideas to be represented with precision, and they acquired in immense importance, when the improvement of methods of analysis, which took place about the beginning of our period, enabled the composition of the so-called "organic" bodies to be determined

with rapidity and piecision. A large proportion of these compounds contain not more than three or four elements, of which carbon is the chief, but then number is very great, and the diversity of then physical and chemical properties is astonishing The ascertainment of the proportion of each element in these compounds affords little or no help towards accounting for their diversities, widely different bodies being often very similar, or even identical, in that respect. And, in the last case, that of isomore compounds, the appeal to diversity of arrangement of the identical compowent units was the only obvious way out of the difficulty. Here, again, hypothesis proved to be of great value; not only was the search for evidence of diversity of molecular structure successful but the study of the process of taking to pieces led to the discovery of the way to put together; and vist numbers of compounds, some of them previously known only as products of the living economy, have thus been artificially constructed. Chemical work, at the present day is, to a large extent synthetic or creative—that is to say, the chemist determines, theoretically, that certain non-existent compounds ought to be moducible, and he proceeds to produce them.

It is largely because the chemical theory and



<sup>1</sup> At present, more organic analyses are made in a single day that were accomplished before Liebng's time in a whole year?"

-Hofmann, Funaday Lecture, p. 40

practice of our epoch have passed into this deductive and synthetic stage, that they are entitled to the name of the "New Chemistry" which they commonly receive—But this new chemistry has grown up by the help of hypotheses, such as those of Dalton and of Avogadio, and that singular conception of bonds" invented to colligate the facts of "valency" or "atomicity," the first of which took some time to make its way, while the second tell into oblivion, for many years after it was propounded, for lack of empirical justification—As for the third, it may be doubted if any one regards it as more than a temporary contrivance

But some of these hypotheses have done vet further service. Combining them with the mechanical theory of heat and the doctime of the conscivation of energy, which are also products of our time, physicists have arrived at an entirely new conception of the nature of gaseous bodies and of the relation of the physico-chemical units of matter to the different forms of energy. The conduct of gases under raiving pressure and temperature, their diffusibility, their relation to radiant heat and to light, the evolution of heat when bodies combine, the absorption of heat when they are dissociated, and a host of other molecular phonemena, have been shown to be deducible from the dynamical and statical principles which apply to molar motion and rest, and the tendency of physico-chemical science is clearly towards the

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reduction of the problems of the world of the intuntely little, as it already has reduced those of the infinitely great world, to questions of mechances'

In the meanwhile, the primitive atomic theory. which has served as the scaffolding for the edifice of modern physics and chemistry, has been quietly dismissed. I cannot discover that any contempolary physicist of chemist believes in the real indivisibility of atoms, or in an interatomic matterless The term 'atoms appears to be used vacuum as a mere name for physico-chemical units which have not yet been subdivided, and "molecules" for physico-chemical units which are aggregates of the former. And these undividualised particles are supposed to move in an endless ocean of a pastly more subtle matter—the other. If this other is a continuous substance, therefore we have got back from the hypothesis of Dalton to that of Descartes But there is much reason to believe that science is going to make a still further journey, and, in form, if not altogether in substance to return to the point of view of Aristotle

The greater number of the sc-called 'clementary' bodies, now known, had been discovered before the commencement of our epoch, and it had become apparent that they were by no means

<sup>1</sup> In the preface to his Mécanique Chinique, M Berthelot decimes his object to he "tamener la mime tour entière—aux mêmes principes meramques que l'absent déja les diverses la milles de la physique

equally similar or dissimilar, but that some of them, at any rate constituted groups, the several members of which were as much like one another as they were unlike the rest. Chlorine, todine, bromine, and fluorine thus formed a very distinct group, sulphur and selemum another, boron and silicon another, potassium, sodium, and lithium another; and so on. In some cases, the atomic weights of such allied bodies were nearly the same, or could be arranged in series, with like differences between the several terms. In fact, the elements afforded indications that they were susceptible of a classification in natural groups, such as those into which mimals and plants fall.

Recently this subject has been taken up afresh with a result which may be stated roughly in the following terms. If the sixty-five or sixty-eight recognised "elements" are arranged in the order of their atomic weights—from hydrogen, the lightest, as unity, to manum, the heaviest, as 240—the series does not exhibit one continuous progressive modification in the physical and chemical characters of its several terms but breaks up into a number of sections, in each of which the several terms present analogies with the corresponding terms of the other series

Thus, the whole series does not run

but

$$a, b, c, d \in \mathcal{B}, c, \mathcal{D}, a, \beta, \gamma, \delta, &c$$
,

di .......

so that it is said to express a periodic law of recurrent similarities. On the relation may be expressed in another way. In each section of the series the atomic weight is greater than in the preceding section, so that if v is the atomic weight of any element in the first segment, w+r will represent the atomic weight of any element in the next and w+x+y the atomic weight of any element in the next, and so on. Therefore the sections may be represented as parallel series, the corresponding terms of which have analogous properties, each successive series starting with a body the atomic weight of which is greater than that of any in the preceding series, in the following fashion.

J	D	δ
C	U	$\gamma$
b	В	β
u	<b>A</b> .	а
$\frac{u}{w}$	$\overline{w+a}$	$\overline{w+x+y}$

This is a conception with which biologists are very familiar, animal and plant groups constantly appearing as series of parallel modifications of similar and yet different primary forms. In the living world, facts of this kind are now understood to mean evolution from a common prototype. It is difficult to imagine that in the not-living world they are devoid of significance. Is it not possible nay, probable, that they may mean the evolution of our "elements" from a primary undifferent

equally similar or dissimilar, but that some of them, at any rate, constituted groups, the several members of which were as much like one another as they were unlike the rest. Chlorine, todine, bromme, and fluorine thus formed a very distinct group, sulphin and selemin another, boron and silicon another, potassium, sodium, and lithium another, and so on. In some cases, the atomic weights of such allied bodies were nearly the same, or could be arranged in series, with like differences between the several terms. In fact, the elements afforded indications that they were susceptible of a classification in natural groups, such as those into which animals and plants fall

Recently this subject has been taken up afresh, with a result which may be stated roughly in the following terms. If the sixty-five or sixty-eight recognised "elements" are arranged in the order of their atomic weights—from hydrogen, the lightest, as unity, to uranium, the heaviest as 240—the series does not exhibit one continuous progressive modification in the physical and chemical characters of its sever diterms, but breaks up into a number of sections, in each of which the several terms present analogies with the corresponding terms of the other scries

Thus, the whole series does not run

$$\alpha$$
 b, c, d, e, f, g, h, i, h, &c,

but

$$\alpha, b, c, d, \Lambda, B, C, D, \alpha, \beta, \gamma, \delta, \&c$$

so that it is said to express a periodic law of recurrent similarities. On the relation may be expressed in another way. In each section of the series, the atomic weight is greater than in the preceding section, so that if v is the atomic weight of any element in the first segment, u + x will represent the atomic weight of any element in the next, and w + x + y the atomic weight of any element in the next, and so on. Therefore the sections may be represented as parallel series, the corresponding terms of which have analogous properties; each successive series starting with a body the atomic weight of which is greater than that of any in the preceding series, in the following fashion

$$\begin{array}{cccc}
d & D & \delta \\
c & C & \gamma \\
h & B & \beta \\
\frac{\alpha}{m} & \frac{\Lambda}{w+x} & \frac{\alpha}{w+x+y}
\end{array}$$

This is a conception with which biologists are very familiar, animal and plant groups constantly appearing as series of parallel modifications of similar and yet different primary forms. In the living world, facts of this kind are now understood to mean evolution from a common prototype. It is difficult to imagine that in the not-living world they are devoid of significance. Is it not possible, nay, probable, that they may mean the evolution of our "elements" from a primary undifferent

trated form of matter. Fitty years ago, such a suggestion would have been scouted as a revival of the dreams of the alchemists. At present, it may be said to be the burning question of physicochemical science.

In fact, the so-called 'vortex-ing" hypothers is a very scrious and remarkable attempt to deal with material units from a point of view which is consistent with the doctrine of evolution. supposes the other to be a uniform substruce, and that the "elementary' units are, broadly speakmg, permanent whirlpools, or vortices, of this ether, the properties of which depend on then actual and potential modes of motion carious and highly interesting to remark that this hypothesis icminds us not only of the speculations of Descartes, but of those of Austotle semblance of the "voitex-rings" to the "tourbillons" of Descartes is little more than nominal but the correspondence between the modern and the ancient notion of a distinction between primary and derivative matter is to a certain For this ethereal 'Unstoff" of the extent, real modern corresponds very closely with the moon Non of Austotle, the materia prime of his mediavai followers, while matter, differentiated into our elements, is the equivalent of the first stage. of progress towards the Loxárn Van, or finished matter, of the ancient philosophy

If the material units of the existing order of

Nature are specialised portious of a relatively homogeneous materia prima-which were originited under conditions that have long ceased to exist and which remain unchanged and unchangeable under all conditions, whether natural or artificial, hitherto known to us-it follows that the speculation that they may be indefinitely altered or that new units may be generated under conditions yet to be discovered, is perfectly legitimate. Theoretically, at any rate the transmutability of the elements is a verifiable scientific hypothesis and such inquiries as those which have been set afoot into the possible dissociative action of the great heat of the sun upon our elements, are not only legitimate, but are likely to yield results which whether affirmative or negative, will be of great importance The idea that atoms are absolutely ingenerable and immutable "manufactured articles" stands on the same sort of foundation as the idea that biological species are "manafactured articles" stood thaty years ago, and the supposed constancy of the elementary atoms, during the enormous lanse of time measured by the existence of our universe. is of no more weight against the possibility of change in them, in the infinity of antecedent time, than the constancy of species in Egypt, since the days of Rameses or of Cheops, is evidence of their immutability during all past epochs of the earth's history. It seems safe to

prophesy that the hypothesis of the evolution of the elements from a primitive matter will, in future, play no less a part in the history of science than the atomic hypothesis, which, to begin with, had no greater, if so great, an empirical foundation

It may perhaps occur to the reader that the boasted progress of physical science does not come to much, it our present conceptions of the fundamental nature of matter are expressible in terms employed, more than two thousand years ago, by the old "master of those that know" Such a criticism, however, would involve forgetfulness of the fact, that the connotation of these terms, in the mind of the modern, is almost infinitely different from that which they possessed in the mind of the ancient philosopher antiquity, they meant little more than vague speculation, at the present day, they indicate definite physical conceptions, susceptible of mathematical treatment, and giving rise to innumerable deductions, the value of which can be experimentally tested The old notions produced little more than floods of dialectics, the new me powerful aids towards the increase of solid knowledge.

Everyday observation shows that, of the bodies which compose the material world, some are in motion and some are, or appear to be, at rest. Of the bodies in motion, some, like the sun and stars,

exhibit a constant movement, regular in amount and direction, for which no external cause appears Others, as stones and smoke, seem also to move of themselves when external impediments are taken away. But these appear to tend to move in opposite directions: the bodies we call heavy, such as stones, downwards, and the bodies we call light, at least such as smoke and steam, upwards as we further notice that the earth, below our feet is made up of heavy matter, while the air above our heads is extremely light matter, it is easy to regard this fact as evidence that the lower region is the place to which heavy things tend—then proper place, in short—while the upper region is the proper place of light things, and to generalise the facts observed by saying that bodies which are free to move, tend towards their proper places. All these seem to be natural motions, dependent on the inherent faculties, or tendencies, of bodies themselves But there are other motions, which are artificial or violent, as when a stone is thrown from the hand, or is knocked by another stone in In such cases as these for example, when a stone is cast from the hand, the distance travelled by the stone appears to depend partly on its weight, and partly upon the excition of the thrower. So that, the weight of the stone remaining the same, it looks as if the motive power communicated to it were measured by the distance to which the stone travels—as if, in other words, the power needed to send it a hundred yards was twice as great as that needed to send it lifty yilds These, apparently obvious, conclusions from the everyday appearances of rest and motion fauly represent the state of opinion upon the subject which prevailed among the ancient Greeks, and remained dominant until the age of Galileo publication of the 'Principia" of Newton, in 1686-7, marks the epoch at which the progress of mechanical physics had effected a complete revolution of thought on these subjects. By this time, it had been made clear that the old generalisations were either incomplete or totally erroneous, that a body once set in motion, will continue to move in a straight line for any concervable time or distance, unless it is interfered with, that any change of motion is proportional to the 'force' which causes it, and takes place in the direction in which that "force is exerted. and that, when a body in motion acts as a cause of motion on another, the latter gams is much as the tormer loses, and rice versi It is to be noted however, that while, in contradistinction to the uneient idea of the inherent tendency to motion of bodies, the absence of any such spontaneous power of motion was accepted as a physical ariom by the moderns, the old conception vurually maintained itself in a new shape. For, in spite of Newton's well-known waining against the " ibsurdity" of supposing that one hody can act

on another at a distance through a vacanta, the ultimate particles of matter were generally assumed to be the seats of perennial causes of motion termed "attractive and repulsive forces," in virtue of which, any two such particles, without any external impression of motion or intermediate material agent, were supposed to tend to approach or remove from one another and this new of the duality of the cruses of motion is very widely held at the present day

Another important result of investigation, attained in the seventeenth century was the proof and quantitative estimation of physical mertia. In the old philosophy, a curious conjunction of ethical and physical prejudices had led to the notion that there was something ethically bad and physically obstructive about matter Austotle attributes all irregularities and apparent dysteleologies in nature to the disobedience, or sluggish yielding, of matter to the shaping and guiding influence of those reasons and causes which were hypostatised in his ideal ' Forms ' In modern science, the conception of the mertia, or resistance to change of matter is complex. In part, it contains a corollary from the law of causation. A body cannot change its state in respect of rest or motion without a sufficient cause But, in part it contains generalmations from experience. One of these is that there is no such sufficient cause resident in any body, and that therefore it will rest, or continue

in naction, so long as no external consect change acts upon it. The other is that the effect which the impact of a body in motion produces upon the body on which it impinges depends, other things being alike, on the relation of a certain quality of each which is called "mass. Given a cause of motion of a certain value, the amount of motion. measured by distance travelled in a certain time. which it will produce in a given quantity of matter, say a cubic tach, is not always the same. but depends on what that matter is—a cubic meh of non will go faster than a cubic inch of gold Hence, it appears, that since equal amounts of motion have, ar hypothesi, been produced the amount of motion in a body does not depend on its speed alone, but on some property of the body To this the name of "mass" has been given And. since it seems reasonable to suppose that a large quantity of matter, moving slowly, possesses as much motion as a small quantity moving faster, has been held to express quantity of matter." It is further demonstrable that, at any given time and place, the relative mass of any two bodies is expressed by the ratio of their weights

When all these great truths respecting molar motion, or the movements of visible and tangible masses, had been shown to hold good not only of terrestrial bodies, but of all those which constitute the visible universe, and the movements of the macrocosm had thus been expressed by a general

mechanical theory, there remained a vast number of phenomena, such as those of light, heat, electricity, magnetism, and those of the physical and chemical changes which do not involve niolai Newton's corpuscular theory of light was an attempt to deal with one great series of these phenomena on mechanical principles, and it maintained its ground until, at the beginning of the nineteenth century, the andulatory theory proved itself to be a much better working hypothesis Heat, up to that time, and indeed much later, was regarded as an imponderable substance, inforce, as a thing which was absorbed by bodies when they were wanned, and was given out as they cooled and which, moreover, was capable of entering into a sort of chemical combination with them, and so becoming latent Rumford and Davy had given a great blow to this view of heat by proving that the quantity of heat which two portions of the same body could be made to give out, by rubbing them together, was practically illimitable. This result brought philosophers face to face with the contradiction of supposing that a finite body could contain an infinite quantity of another body, but it was not until 1843 that clear and unquestionable experimental proof was given of the fact that there is a definite relation between mechanical work and heat, that so much work always gives rise under the same conditions. to so much heat, and so much heat to so much mechanical work. Thus originated the inechanical theory of heat, which became the starting point of the modern doctrine of the conservation of energy. Molar motion had appeared to be destroyed by friction. It was proved that no destruction took place, but that an exact equivalent of the energy of the lost molar motion appears as that of the molecular motion, or motion of the smallest particles of a body, which constitutes heat. The loss of the masses is the gain of their particles.

Before 1843, however, the doctrum of the conservation of energy had been approached. Bacon's chief contribution to positive science is the happy guess (for the context shows that it was little more) that heat may be a mode of motion, Descartes affirmed the quantity of motion in the world to be constant, Newton nearly gave expression to the complete theorem, while Rumford's and Davy's experiments suggested, though they did not prove the equivalency of mechanical and thermal energy Again, the discovery of voltage electricity, and the marvellous development of knowledge, in that field, effected by such men as Davy, Faraday, Oersted, Ampère, and Melloni, had brought to light a number of facts which tended to show that the so-called "forces" at work in light, heat, electricity, and magnetism, in chemical and in ineclianical operations, were intimately, and, in various cases, quantitatively related It was demonstrated that any one could

be obtained at the expense of any other, and apparatus was devised which exhibited the evolution of all these kinds of action from one source of energy. Hence the idea of the correlation of forces "which was the immediate forcumier of the doctrine of

the conservation of energy

It is a remarkable evidence of the greatness of the progress in this direction which has been effected in our time, that even the second edition of the History of the Inductive Sciences," which was published in 1846, contains no allusion either to the general view of the 'Correlation of Forces' published in England in 1842, or to the publication in 1843 of the flist of the series of experiments by which the mechanical equivalent of heat was correctly ascertained. Such a failure on the part of a contemporary, of great acquirements and remarkable intellectual powers, to read the signs of the times, is a lesson and a warning worthy of being deeply pondered by any one who

This is the more curious as Ampere's hypothesis that vibrations of molecules causing and caused by vibrations of the either, constitute heat, is discussed. See vol. in p. 557, 2nd ed. In the Phalosophy of the Industrie Stances 2nd ed. 1847, p. 239. When the remarks, a propos of Bicon's definition of heat, "that it is an expansive, testi aned motion, modified in certain ways and exerted in the smaller particles of the body." that "distough the exact nature of heat is still an obscure and controveried matter, the science of heat now consists of many important tuths, and that to none of these truths is there any approximation in Bicon's essay." In point of fact, Baron's statement however much open to criticism, does contain a distinct approximation to the most important of all the truths respecting heat which had been discovered when Whowell wrote.

attempts to prognosticate the course of scientific

progress

I have pointed out that the growth of clear and definite views respecting the constitution of matter has led to the conclusion that so far as natural agencies are concerned, it is ingenerable and indestructible. In so far as matter may be conceived to exist in a purely passive state, it is, imaginably, older than motion. But, as it must be assumed to be susceptible of motion, a particle of bare matter at rest must be endowed with the potentiality of motion Such a particle, however, by the supposition, can have no energy, for there is no cause why it should move Suppose now that it receives an impulse, it will begin to move with a velocity inversely proportional to its mass, on the one hand, and directly proportional to the strength of the impulse, on the other, and will possess kinetic energy, in virtue of which it will not only continue to move for ever if unmapeded, but if it impinges on another such particle, it will impart more or less of its motion to the latter Let it be conceived that the particle acquires a tendency to move, and that nevertheless it does not move. It is then in a condition totally different from that in which it was at first. A cause competent to produce motion is operating upon it, but, for some reason or other, is unable to give rise to If the obstacle is removed, the energy which was there, but could not manifest itself, at

once gives use to motion. While the restraint lasts, the energy of the particle is merely potential, and the case supposed illustrates what is meant by potential energy. In this contrast of the potential with the actual, modern physics is turning to account the most familiar of Aristotelian distinctions—that between δύναμις and ἐνέργεια.

That kinetic energy appears to be imparted by impact is a fact of daily and hourly experience we see bodies set in motion by bodies, already in motion, which seem to come in contact with them It is a truth which could have been learned by nothing but experience, and which cannot be explained, but must be taken as an ultimate fact about which, explicable or inexplicable, there can be no doubt Strictly speaking, we have no direct apprehension of any other cause of motion. But experience furnishes innumerable examples of the production of kinetic energy in a body previously at rest, when no impact is discernible as the cause of that energy In all such cases, the presence of a second body is a necessary condition, and the amount of kinetic energy, which its presence enables the first to gain, is strictly dependent on the relative positions of the two Hence the phrase energy of position, which is frequently used as equivalent to potential energy. It a stone is picked up and held, say, six feet above the ground, it has potential energy, because, if let go, it will immediately begin to move towards the earth,

and this energy may be said to be run qy of position. because it depends upon the relative position of the earth and the stone. The stone is solicited to move but cannot, so long as the muscular strength of the holder prevents the solicitation from taking effect The stone, therefore, has potential energy, which becomes kinetic if it is let go, and the amount of that kinetic energy which will be developed before it strikes the earth depends on its position—on the fact that it is, say, six feet off the earth, neither more nor less. Moreover, it can be proved that the raiser of the stone had to exert as much energy in order to place it in its position, as it will develop in falling. Hence the energy which was exerted, and apparently exhausted, in raising the stone, is potentially in the stone, in its raised position, and will manifest itself when the stone is set free. Thus the energy, withdrawn from the general stock to raise the stone, is returned when it falls, and there is no change in the total amount Energy, as a whole, is conserved

Taking this as a very broad and general statement of the essential facts of the case, the ruising of the stone is intelligible enough, as a case of the communication of motion from one body to another. But the potential energy of the raised stone is not so easily intelligible. To all appearance, there is nothing either pushing or pulling it towards the earth, or the earth towards it, and yet it is quite certain that the stone tends to move

towards the earth and the court towards the stone, in the way defined by the law of gravitation

In the currently accepted language of science, the cause of motion, in all such cases as this, when bodies tend to move towards or away from one another, without any discernible impact of other bodies, is termed a 'force," which is called "attractive in the one case, and repulsive in the other. And such attractive or repulsive forces are often spoken of as if they were real things, capable of exerting a pull or a push, upon the particles of matter concerned. Thus the potential energy of the stone is commonly said to be due to the "force" of gravity which is continually operating upon it

Another illustration may make the case plamer, The bob of a pendulum swings first to one side and then to the other of the centre of the arc Suppose it to have just which it describes reached the summit of its right-hand half-swing It is said that the "attractive forces" of the bob for the earth, and of the earth for the bob set the former in motion; and as these "forces ' are continually in operation, they confer an accelerated velocity on the bob, until, when it reaches the centre of its swing, it is, so to speak, fully charged with kinetic energy. If, at this moment, the whole material universe, except the bob, were abolished, it would move for ever in the direction of a tangent to the muldle of the arc described



As a matter of fact, it is compelled to travel through its left-hand half-swing, and thus virtually to go Consequently, the 'attractive forces" of the bob and the earth are now acting against it. and constitute a resistance which the charge of kinetic energy has to overcome But, as this charge represents the operation of the attractive torces during the passage of the bob through the right-hand half-swing down to the centre of the are, so it must needs be used up by the passage of the bob upwards from the centre of the arc to the summit of the left-hand half-swing at this point, the bob comes to a momentary rest The last traction of kinetic energy is just neutralused by the action of the attractive forces, and the bob has only potential energy equal to that with which it started So that the sum of the plienomena may be stated thus. At the summit of either half-arc of its swing, the bob has a certain amount of potential energy, as it descends it gradually exchanges this for kinetic energy, until at the contre it possesses an equivalent amount of kinetic energy, from this point onwards, it gradually loses kinetic energy as it ascends until, at the summit of the other half-arc, it has acquired an exactly similar amount of potential energy Thus, on the whole transaction, nothing is either lost or gained, the quantity of energy is always the same, but it passes from one form into the other

To all appearance, the phenomena exhibited by the pendulum are not to be accounted for by impact in fact it is usually assumed that corresponding phenomena would take place if the earth and the pendulum were situated in an absolute vacuum, and at any concervable distance from one another If this be so, it follows that there must be two totally different kinds of causes of motion the one impact—a vera cousa, of which, to all appearance, we have constant experience, the other, attractive or repulsive "force"-a metaphysical entity which is physically inconceivable. Newton expressly repudiated the notion of the existence of attractive forces, in the sense in which that term is ordinarily understood, and he refused to put forward any hypothesis as to the physical cause of the so-called "attraction of gravitation ' As a general rule, his successors have been content to accept the doctrine of attractive and repulsive forces, without troubling themselves about the philosophical difficulties which it involves But this has not always been the case, and the attempt of Lo Sage, in the last century, to show that the phenomena of attraction and repulsion are susceptible of explanation by his hypothesis of bombaidment by ultramundane particles, whether tenable or not, has the great ment of being an attempt to get rid of the dual conception of the causes of motion which has hitherto prevailed. On this hypothesis, the hammering of the ultra-numbane corpuscles on the bob confers its kinetic energy, on the one hand, and takes it away on the other, and the state of potential energy means the condition of the bob during the instant at which the energy, conferred by the hammering during the one half-arc, has just been exhausted by the hammering during the other half-arc. It seems safe to look forward to the time when the conception of attractive and repulsive forces, having served its purpose as a useful piece of scientific scaffolding, will be replaced by the deduction of the phenomena known as attraction and repulsion, from the general laws of motion.

The doctrine of the conservation of energy which I have endeavoured to illustrate is thus defined by the late Cherk Maxwell

The total energy of any body or system of bodies is a quantity which can neither be increased nor diminished by any mutual action of such bodies, though it may be transformed into any one of the forms of which energy is susceptible." It follows that energy, like matter, is indestructible and ingenerable in nature. The phenomenal world, so far as it is material, expresses the evolution and involution of energy its passage from the kinetic to the potential condition and back again. Wherever motion of matter takes place that motion is effected at the expense of part of the total store of energy.

Hence as the phenomena exhibited by living beings in so far as they are material, are all inolar or molecular motions, these are included under the general law. A living body is a machine by which energy is transformed in the same sense as a steam-engine is so, and all its movements, molar and molecular, are to be accounted for by the energy which is supplied to it. The phenomena of consciousness which arise, along with certain transformations of energy, cannot be interpolated in the series of these transformations inasmuch as they are not motions to which the doctrine of the conservation of energy applies. And, for the same reason they do not necessitate the using up of energy, a sensation has no mass and cannot be conceived to be susceptible of movement particular molecular motion dues give rise to a state of consciousness is experimentally certain, but the how and why of the process are just as mexplicable as in the case of the communication of kinetic energy by impact

When dealing with the doctrine of the ultimate constitution of matter we found a certain resemblance between the oldest speculations and the newest doctrines of physical philosophers. But there is no such resemblance between the ancient and modern views of motion and its causes, except in so far as the conception of attractive and repulsive forces may be regarded as the modified descendant of the Aristotchan conception of forms.

In fact, it is hardly too much to say that the essential and fundamental difference between ancient and modern physical science has in the ascertainment of the true laws of statics and dynamics in the course of the last three continues, and in the invention of mathematical methods of dealing with all the consequences of these laws. The ultimate aim of modern physical science is the deduction of the phenomena exhibited by material bodies from physico-mathematical first principles. Whether the human intellect is strong enough to attain the goal set before it may be a question, but thither will it surely strive.

The third great scientific event of our time, the rehabilitation of the doctains of evolution, is part of the same tendency of increasing knowledge to unity itself, which has led to the doctains of the conservation of energy. And this tendency, again is mainly a product of the increasing strength conferred by physical investigation on the belief in the universal validity of that orderly relation of facts, which we express by the so-called 'Laws of Nature'

The growth of a plant from its send, of an animal from its egg, the apparent origin of innumerable living things from mind, or from the putretying remains of former organisms, had furnished the earlier scientific thinkers with

abundant analogies suggestive of the conception of a corresponding method of cosmic evolution from a formless "chaos to an ordered world which mucht either continue for ever or undergo dissolution into its elements before starting on It is therefore no a new course of evolution wonder that, from the days of the Ionian school onwards, the view that the universe was the result of such a process should have maintained itself as a leading dogma of philosophy emanistic theories which played so great a part in Neoplatonic philosophy and in Gnostic theology me forms of evolution. In the seventeenth contury, Descartes propounded a scheme of evolution, as an hypothesis of what might have been the mode of orem of the world, while professing to accept the ecclesiastical scheme of creation, as an account of that which actually was its manner of coming into existence In the eighteenth century, Kant put forth a remarkable speculation as to the origin of the solar system, closely similar to that subsequently adopted by Laplace and destined to become famous under the title of the 'nebular hvpothesis '

The careful observations and the acute reasonings of the Italian geologists of the seventeenth and eighteenth centuries, the speculations of Leibnitz in the "Protogica" and of Buffon in his "Théorie de la Terre," the sober and profound reasonings of Hutton in the latter part of the voir i



eighteenth century, all these tended to show that the fabric of the earth itself implied the continuation of processes of natural causation for a period of time as great, in relation to human history as the distances of the heavenly bodies from us are, in relation to terrestrial standards of measurement. The abysis of time began to boom as large as the abysis of space. And this revelation to sight and touch of a link here and a link there of a practically infinite chain of natural causes and effects, prepared the way, as perhaps nothing else has done, for the modern form of the uncient theory of evolution

In the beginning of the eighteenth century, De Mallet made the first serious attempt to apply the doctrine to the living world. In the latter part of it Erasmus Daiwin Goethe Trevitarius, and Lamarch took up the work more vigorously and with better qualifications. The question of special creation, or evolution lay at the bottom of the fierce disputes which broke out in the French Academy between Crivier and St.-Hilaure, and, for a time, the supporters of biological evolution were silenced, it not answered, by the alliance of the preatest naturalist of the age with their ecclestastical opponents. Catastrophism, a short-sighted teleology, and a still more short-sighted othodoxy, joined forces to crush evolution

Lyell and Poulett Scrope, in this country, resumed the work of the Italians and of Hutton and the

former, aided by a marvellous power of clear exposition, placed upon an irrefragable basis the truth that natural causes are competent to account for all events, which can be proved to have occurred, in the course of the secular changes which have taken place during the deposition of the stratified rocks. The publication of "The Principles of Geology" in 1830, constituted an epoch in geological science. But it also constituted an epoch in the modern history of the doctrine of evolution, by raising in the mind of every intelligent reader this question. If natural causation is competent to account for the not-living part of our globe, why should it not account for the living part?

By keeping this question before the public for some thirty years, Lyell, though the keenest and most formidable of the opponents of the transmutation theory, as it was formulated by Lomaick, was of the greatest possible service in facilitating the reception of the sounder doctrines of a later And, in like fashion, another vehement opponent of the transmutation of species, the elder Agassiz, was dooined to help the cause he hated Agassiz not only maintained the fact of the progressive advance in organisation of the inhabitants of the earth at each successive geological epoch but he insisted upon the analogy of the steps of this progression with those by which the embryo advances to the adult condition, among the highest forms of each group. In fact, in endeavouring to

support these views he went a good way beyond the limits of any cautious interpretation of the facts then known

Although little acquainted with biological science, Whewell seems to have taken particular pains with that pair of his work which deals with the history of geological and biological speculation, and several chapters of his seventeenth and eighteenth books, which comprise the history of physiology, of comparative anatomy and of the palætiological sciences, vividly reproduce the controversies of the early days of the Victorian epoch as in the case of the doctrine of the conservation of energy, the historian of the inductive sciences has no prophetic insight, not even a suspicion of that which the near future was to bring forth And those who still repeat the once favourite objection that Darwin's 'Origin of Species' is nothing but a new version of the Philosophie zoolog.que" will find that so live as 1844. Whewell had our the slightest suspicion of Darwin's main theorem. even as a logical possibility. In fact, the publication of that theorem by Darwin and Wallace, in 1859 took all the biological would by surprise Neither those who were juclined towards the "progressive transmutation ' or "development" doctrine, as it was then called, nor those who were opposed to it, had the slightest suspicion that the tendency to variation in living beings, which all admitted as a matter of fact, the selective influence of conditions, which no one could deny to be a matter of fact when his attention was drawn to the evidence, and the occurrence of great geological changes, which also was matter of fact, could be used as the only necessary postulates of a theory of the evolution of plants and annuals which, even it not, at once competent to explain all the known facts of biological science, could not be shown to be inconsistent with any So far as biology is concerned the publication of the Origin of Species," for the first time, put the doctime of evolution in its application to living things, upon a sound scientific foundation. It became an instrument of investigation, and in no hands did it prove more brilliantly profitable than in those of Durwin lumselt His imblications on the effects of dome-tication in plants and animals, on the influence of cross-fertilisation, on flowers as organs for effecting such fertilisation on insectivolous plants, on the motions of plants, pointed out the iontes of exploration which have since been followed by hosts of inquiers, to the great profit of science

Darwin found the biological world a more than sufficient field for even his great powers, and left the cosmical part of the doctrine to others. Not much has been added to the nebular hypothesis, since the time of Laplace, except that the attempt to show (against that hypothesis) that all nebula are star clusters, has been met by the spectroscopic

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proof of the gaseous condition of some of them. Moreover, physicists of the present generation appear now to accept the secular cooling of the earth, which is one of the corollaries of that hy pothesis. In fact, attempts have been made, by the help of deductions from the data of physics, to Lay down an approximate limit to the number of millions of years which have clapsed since the earth was habitable by living beings. If the conclusions thus reached should stand the test of tipther investigation, they will undoubtedly be very But whether true or false, they can have no influence upon the doctains of evolution in its application to living organisms. The occurrence of successive forms of life upon our globe is an Instornal fact, which cannot be disputed, and the relation of these successive forms as stages of evetution of the same type, is established in various cases The biologist has no means of determining the time over which the process of evolution has extended, but accepts the computation of the physical geologist and the physicist, whatever that may be.

Evolution, as a philosophical doctrine applicable to all phenomena, whether physical or mental, whether manifested by material atoms or by men in society, has been dealt with systematically in the "Synthetic Philosophy" of Mr. Herbert Spencer Comment on that great undertaking would not be in place here. I mention it because.

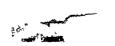
so far as I know, it is the flist attempt to deal, on scientific principles, with modern scientific facts and speculations. For the 'Philosophie positive" of M Comte, with which Mi Spencer's system of philosophy is sometimes compared, though it professes a similar object, is unfortunately permeated by a thoroughly unscientific spirit, and its author had no adequate acquaintance with the physical sciences even of his own time

The doctine of evolution, so in as the present physical cosmos is concerned, postulates the fixity of the rules of operation of the causes of motion in the material universe. It all kinds of matter are modifications of one kind and if all inodes of motion are derived from the same energy the orderly evolution of physical nature out of one substratum and one energy implies that the rules of action of that energy should be fixed and definite. In the past history of the universe, back to that point there can be no room for chance or disorder. But it is possible to raise the question whether this universe of snaplest matter and definitely operating energy, which forms our hypothetical starting point, may not itself be a product of evolution from a universe of such matter, in which the manifestations of energy were not definite—in which, for example, our laws of motion held good for some units and not for others, or for the same units at one time and not at another—and which would therefore be a real epicineum chance-would?

For myself, I must confess that I find the an of this region of speculation too rarefied for my constitution, and I am disposed to take refuge in "ignoramus et ignorabilities"

The execution of my further task, the indication of the most important achievements in the several branches of physical science during the last fifty years, is embarrassed by the abundance of the objects of choice, and by the difficulty which every one, but a specialist in each department must find in drawing a due distinction between discoveries which strike the imagination by their novelty, or by their practical influence, and those unobtrusive but pregnant observations and experiments in which the germs of the great things of the future really he Moreover, my limits restrict inc. to little more than a bare chronicle of the events which I have to notice

In physics and chemistry the old boundaries of which sciences are rapidly becoming effaced, one can hardly go wrong in ascribing a primary value to the investigations into the relation between the solid, liquid and gaseous states of matter on the one hand, and degrees of pressure and of heat on the other. Almost all, even the most refractory, solids have been vaporaised by the intense heat of the electric arc, and the most refractory gases



have been forced to assume the liquid, and even the solid, forms by the combination of high pressure with intense cold. It has further been shown that there is no discontinuity between these states—that a gas passes into the liquid state through a condition which is neither one nor the other and that a liquid body becomes solid or a solid liquid, by the intermediation of a condition in which it is neither truly solid nor truly liquid.

Theoretical and experimental investigations have concurred in the establishment of the view that a gas is a body, the particles of which are in incessant rectilinear motion at high velocities colliding with one another and bounding back when they strike the walls of the containing vessel, and. on this theory, the aheady escertained relations of gaseous bodies to heat and pressure have been shown to be deducible from mechanical principles Immense improvements have been effected in the means of exhausting a given space of its gaseous contents, and experimentation on the phenomena which attend the electric discharge and the action of radiant heat, within the extremely rarefied media thus produced has yielded a great number of remarkable results, some of which have been made familiar to the public by the Gicselei tubes and the radiometer. Already, these investigations have afforded an unexpected insight into the constitution of matter and its relations with thermal and electric energy, and they open up a vast field for future inquiry into some of the deepest problems of physics. Other important steps in the same direction, have been effected by investigations into the absorption of radiant heat proceeding from different sources by solid, fluid and gaseous bodies. And it is a curious example of the interconnection of the various branches of physical science, that some of the results thus obtained have proved of great importance in ineteorology.

The existence of numerous dark lines, constant in their number and position in the various regions of the solar spectrum, was made out by Fraunhofer in the cul, part of the present century, but more than forty years elapsed before their causes were ascertained and their importance recognised Spectroscopy, which then took its rise, is probably that employment of physical knowledge, already won as a means of further acquisition, which most impresses the imagination. For it has suddenly and immensely enlarged our power of overcoming the obstacles which almost infinite nunutences on the one hand, and almost infinite distance on the other, have hitherto opposed to the recognition of the presence and the condition of matter eighteen-millionth of a grain of sodium in the flame of a spirit-lamp may be detected by this instrument; and, at the same time, it gives trustworthy indications of the material constitution not only of the sun, but of the farthest of those fixed stars

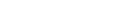


and nebulæ which afford sufficient light to affect the eye, or the photographic plate, of the inquirer

The mathematical and experimental elucidation of the phenomena of electricity and the study of the relations of this turn of energy with chemical and thermal action, had made extensive progress before 1837. But the determination of the influence of magnetism on light, the discovery of diamagnetism, of the influence of crystalline structure on magnetism, and the completion of the matheinatical theory of electricity all belong to the mesent epoch. To it also apperture the practical execution and the working out of the results of the great international system of observations an terrestrial magnetism, suggested by Hamboldt in 1836, and the invention of instruments of infinite delicacy and precision for the quantitative determination of electrical phenomena. The voltage battery has received tast improvements, while the invention of magneto-electric engines and of improved means of producing ordinary electricity has provided sources of electrical energy vastly superior to any before extant in power, and far more convenient to: use

It is perhaps this branch of physical science which may claim the palm for its practical fruits, no less than for the aid which it has furnished to the investigation of other pairs of the field of physical science. The idea of the practicability of establishing a communication between distant

points, by means of electricity, could hardly fail to have simmered in the minds of ingenious men since, well-nigh a century ago, experimental proof was given that electric disturbances could be propagated through a wire twelve thousand feet long Various methods of carrying the suggestion into practice had been carried out with some degree of success but the system of electric telegraphy. which, at the present time, brings all parts of the civilised world within a few minutes of one another. originated only about the commencement of the epoch under consideration In its influence on the course of human affairs, this invention takes its place beside that of gunpowder, which tended to abolish the physical inequalities of fighting men, of printing which tended to destroy the effect of inequalities in wealth among learning men, of steam transport which has done the like for travelling men. All these gifts of science are aids in the process of levelling up, of removing the ignorant and baneful prejudices of inition against nation, province against province, and class against class, of assuring that social order which is the foundation of progress, which has redeemed Europe from barbarism, and against which one is glad to think that those who, in our time, are employing themselves in tanning the embers of ancient wrong, in setting class against class, and in trying to tear asunder the existing bonds of unity, are undertaking a futile struggle. The telephone is only



second in practical importance to the electric telegraph Invented, as it were only the other day it has already taken its place as an appliance of Sixty years ago the extraction of metals from their solutions, by the electric current was simply a highly interesting scientific fact. At the present day, the galvano-plastic art is a great industry and in combination with photography, promises to be of endless service in the arts Electric lighting is another great gift of science to civilisation the practical effects of which have not yet been fully developed, largely on account of its But those whose memories go back to the tinder-box period, and recollect the cost of the first luciter matches, will not despan of the results of the application of science and ingenuity to the cheap production of anything for which there is a large demand

The influence of the progress of electrical knowledge and invention upon that of investigation in other fields of science is highly remarkable. The combination of electrical with mechanical contrivances has produced instruments by which, not only may extremely small intervals of time be exactly measured, but the varying rapidity of movements, which take place in such intervals and appear to the ordinary sense instantaneous, is recorded. The duration of the winking of an eye is a proverbial expression for an instantaneous action, but, by the help of the revolving cylinder

and the electrical make gapparate to spossible to obtain a graphic iccord of such an action in which, if it endures a second, that second shall be subdivided into a hundred, or a thousand, equal parts, and the state of the action at each hundredth, or thousandth, of a second exhibited. In fact, these instruments may be said to be time-micro-Such appliances have not only effected a revolution in physiology, by the power of analysing the phenomena of muscular and nervous activity which they have conferred, but they have furnished new methods of measuring the rate of movement of projectiles to the aitillerist. Again, the microphone, which renders the minutest movements audible, and which enables a listener to hear the footfall of a fly, has equipped the sense of hearing with the means of entering almost as deeply into the penetralia of Nature, as does the sense of sight

That light exerts a remarkable influence in bringing about certain chemical combinations and decompositions was well known fifty years ago and various more or less successful attempts to produce permanent pictures, by the help of that knowledge, had already been made. It was not till 1830 however that practical success was obtained, but the "daguerreotypes" were both cumbrous and costly, and photography would never have attained its present important development had not the progress of invention substituted

paper and glass for the silvered plates then in use It is not my affair to dwell upon the practical application of the photography of the present day. but it is germane to my purpose to remark that it has furnished a most valuable accessory to the methods of recording motions and lapse of time already in existence In the hands of the astronomer and the meteorologist, it has yielded means of registering terrestrial solar, planetary, and stellar phonomena, independent of the sources of error attendant on order my observation, in the hands of the physicist, not only does it record spectroscopic phenomena with unsurpassable ease and precision, but it has revealed the existence of rays having powerful chemical energy or beyond the visible limits of either end of the spectrum. while, to the naturalist, it funishes the means by which the forms of many highly complicated objects may be represented, without possibility of enor which is inherent in the work of the draughtsman. In fact in many cases, the stern imperitality of photography is an objection to its employment it makes no distinction between the important and the unimportant, and hence photographs of dissections, for example, are rarely so useful as the work of a draughtsman who is at once accurate and intelligent

The determination of the custence of a new planet, Neptune, far beyond the previously known bounds of the solar system, by mathematical deduction from the facts of perturbation, and the immediate confirmation of that determination, in the year 1846, by observers who turned their telescopes into the part of the heavens indicated as its place, constitute a remarkable testimony of nature to the validity of the principles of the astronomy of our time. In addition so many new asteroids have been added to those which were already known to circulate in the place which theoretically should be occupied by a planet. between Mars and Jupiter, that they number now amounts to between two and three hundred have already alluded to the extension of our knowledge of the nature of the heavenly bodies by the employment of spectroscopy It has not only thrown wonderful light upon the physical and chemical constitution of the sun, fixed stars, and nebulæ, and comets but it holds out a prospect of obtaming definite evidence as to the nature of our so-called elementary bodies

The application of the generalisations of thermotics to the problem of the duration of the earth, and of deductions from tidal phenomena to the determination of the length of the day and of the time of revolution of the moon, in past epochs of the history of the universe, and the demonstration of the competency of the great secular changes known under the general name of the precession of the equinoxes, to cause corresponding modifications in the climate of the two heim-

spheres of our globe, have brought astronomy into intimate relation with geology. Geology, in fact, proves that, in the course of the past history of the earth, the climatic conditions of the same region have been widely different, and seeks the explanation of this important truth from the sister The facts that, in the middle of the Tertiary epoch, evergreen trees abounded within the arctic circle, and that, in the long subsequent Quaternuy epoch, an arctic climate, with its accompaniment of gigantic glaciers, obtained in the northern hemisphere, as far south as Switzerland and Central France, are as well established as any truths of science. But, whether the explanation of these extreme variations in the mean temperature of a great part of the northern homisphere is to be sought in the concomitant changes in the distribution of land and water surfaces of which geology affords evidence or in astronomical conditions, such as those to which I have referred, is a question which must await its answer from the science of the future

Turning now to the great steps in that vast progress which the biological sciences have made since 1837, we are met, on the threshold of our epoch, with perhaps the greatest of all—namely, the promulgation by Schwann, in 1839, of the generalisation known as the "cell theory," the application and extension of which by a host of subsequent investigators has revolutionised

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morphology developme than diplys ology Thanks to the immense series of labours thus inaugurated, the following fundamental truths have been established

All living bodies contain substances of closely similar physical and chemical composition, which constitute the physical basis of life, known as protoplasm. So far as our present knowledge goes, this takes its origin only from pre-existing protoplasm.

All complex living todies consist, at one period of their existence, of an aggregate of minute portions of such substance, of similar structure, called cells, each cell having its own life independent of the others, though influenced by them.

All the morphological characters of animals and plants are the results of the mode of multiplication, growth, and structural metamorphosis of these cells, considered as morphological units

All the physiological activities of animals and plants—assimilation, secretion, excitation, motion, generation—are the expression of the activities of the cells considered as physiological units. Each individual, among the higher number and plants, is a synthesis of millions of subordinate individualities. Its individuality, therefore, is that of a "civitas" in the ancient sense, or that of the Leviathan of Hobbes

There is no absolute line of demarcation between

annuals and plants. The intimate structure, and the modes of change, in the cells of the two are fundamentally the same. Moreover the higher forms are evolved from lower, in the course of their development by analogous processes of differentiation, coalescence, and reduction in both the vegetable and the annual worlds.

At the present time, the cell theory in consequence of recent investigations into the structure and metamorphosis of the "nucleus," is undergoing a new development of great significance, which among other things, to eshadows the possibility of the establishment of a physical theory of heredity, on a safer foundation than those which Button and Darwin have devised

The popular belief in abiogenesis, or the socalled 'spontaneous" generation of the lower forms of life, which was accepted by all the philosophers of antiquity hold its ground down to the middle of the seventeenth century. Notwithstanding the frequent creation of the phrase, wrongfully attributed to Harvey, 'Omne vivuoi ex ovo,' that great physiologist believed in spontaneous generation as firmly as Aristotle did. And it was only in the latter part of the seventeenth century. that Redi, by simple and well-devised experiments, demonstrated that, in a great number of cases of supposed spontaneous generation, the aumals which made their appearance owed then origin to the ordinary process of reproduction, and thus shook the ancient doctrine to its foundations. In the middle of the eighteenth century, it was revived, in a new form, by Needham and Button, but the experiments of Spallanzam enforced the conclusions of Redi, and compelled the advocates of the occurrence of spontaneous generation to seek evidence for their hypothesis only among the parasites and the lowest and minutest organisms. It is just fifty yours since Schwann and others proved that, even with respect to them, the supposed evidence of absogenesis was untrust-worthy

During the present epoch, the question, whether bying matter can be produced in any other way than by the physiological activity of other living matter has been discussed aftersh with great vigour; and the problem has been investigated by experimental methods of a precision and refinement unknown to previous investigators. The result is that the evidence in favour of abuseeness. has utterly broken down, in every case which has been properly tested. So far as the lowest and minutest organisms are concerned, it has been proved that they never make their appearance, if those precautions by which their germs are certainly excluded are taken And, in regard to parasites, every case which seemed to make for their generation from the substance of the animal, or plant, which they infest has been proved to

have a totally different significance. Whether not-living matter may pass, or ever has, under any conditions, passed into himg matter, without the agency of pre-existing bying matter, necessarily remains an open question, all that can be said is that it does not undergo this inetemorphosis under any known conditions Those who monistic view of the physical world may fairly hold abiogenesis as a pious opinion, supported by analogy and defended by our ignorance. But, as matters stand, it is equally justifiable to record the physical world as a sort of dual monarchy The kingdoms of living matter and of not-living matter are under one system of lans and there is a perfect freedom of exchange and transit from one to the other. But no claim to biological nationality is valid except birth

In the department of anatomy and development, a host of accurate and patient inquirers aided by novel methods of proparation, which enable the anatomist to exhaust the details of visible structure and to reproduce them with geometrical precision, have investigated every important group of living animals and plants, no less than the fossil relies of former faunce and floræ. An enoimous addition has thus been made to our knowledge, especially of the lower forms of life, and it may be said that morphology, however inexhaustible in detail, is complete in its broad features. Classification which is merely a convenient summary expres-

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sion of morphological facts, has undergone a corresponding improvement. The breaks which formerly separated our groups from one another, as animals from plants, vertebrates from invertebrates, cryptogams from phanerogams, have either been filled up, or shown to have no theoretical significance. The question of the position of man, as an animal, has given use to much disputation, with the result of proving that there is no anatomical or developmental character by which he is more wilely distinguished from the group of animals most nearly allied to him, than they are from one another In fact, in this particular, the classification of Linuous has been proved to be more in accordance with the facts than those of most of his successors

The study of man as a genus and species of the unitial world, conducted with reference to no other considerations than those which would be admitted by the investigator of any other form of animal life, has given use to a special branch of biology, known as Anthropology, which has grown with great rapidity. Numerous societies devoted to this portion of science have spring up, and the energy of its devotees has produced a copious literature. The physical characters of the various races of men have been studied with a minuteness and accuracy heretotore unknown, and demonstrative evidence of the existence of human contemporaries of the extinct animals of the latest

geological epoch has been obtained. Physical science has thus been brought into the closest relation with history and with archaeology, and the striking investigations which during outtime, have put beyond doubt the vast antiquity of Babyloman and Egyptian civilisation, are in perfect harmony with the conclusions of anthropology as to the antiquity of the human species

Classification is a logical process which consists in putting together those things which are like and keeping asunder those which are unlike, and a morphological classification, of course takes note only of morphological likeness and unlikeness So long, therefore, as our morphological knowledge was almost wholly confined to anatomy, the characters of groups were solely anatomical but as the phenomena of embryology were explored, the likeness and unlikeness of individual development had to be taken into account, and, at present, the study of ancestral evolution introduces a new element of likeness and unlikeness which is not only emmently deserving of recognition, but must ultimately predominate over all others A classification which shall represent the process of ancestral evolution is, in fact, the end which the labours of the philosophical taxonomist must keep But it is an end which cannot be attained until the progress of paleontology has given us far more insight, than we get possess into the historical facts of the case. Much of the ŧ

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speculative "phylogeny," which abounds among my present contemporaries, reminds me very forcibly of the speculative morphology, unchecked by a knowledge of development, which was rife in my youth. As hypothesis, suggesting inquity in this or that direction, it is often extremely useful. but, when the product of such speculation is placed on a level with those generalisations of morphological truths which are represented by the definitions of natural groups, it tends to confound fancy with fact and to create mere confusion. We are in danger of drifting into a new "Natur-Philosopline' worse than the old because there is less excuse for it. Boyle did great service to science by his 'Sceptical Chemist," and I am inclined to think that, at the present day, a 'Sceptical Biologist" might exert an equally beneficent influence

Whoso wishes to gain a clear conception of the progress of physiology, since 1837, will do well to compare Muller's "Physiology," which appeared in 1835, and Diapiez's edition of Richard's 'Nouveaux Elements de Botanique," published in 1837, with any of the present handbooks of animal and vegetable physiology. Muller's work was a master-piece, unsurpassed since the time of Haller, and Richard's book enjoyed a great reputation at the time, but then successors transport one into a new world. That which characterises the new physiology is that it is permeated by, and indeed based apon, conceptions which, though not wholly

absent are but dawning on the ininds of the older writers

Modern physiology sets torth as its chief ends Firstly, the ascertamment of the facts and conditions of cell-life in general Secondly, in composite organisms, the analysis of the functions of organs into those of the cells of which they are composed Thurdly, the explication of the processes by which this local cell-life is directly, or and rectly, controlled and brought into relation with the life of the rest of the cells which compose the organism Fourthly, the unvestigation of the phenomena of life in general, on the assumption that the physical and chemical processes which take place in the living body are of the same order as those which take place out of it, and that whatever energy is exerted in producing such phenomena is derived from the common stock of energy in the universe. In the fifth place, modern physiology investigates the relation between physual and psychical phenomena on the assumption that molecular changes in definite portions of nervous matter stand in the relation of necessary antecedents to definite mental states and operations. The work which has been done in each of the directions here indicated is vast, and the accumulation of solid knowledge, which has been effected, is correspondingly great. For the first time in the history of science physiologists are now in a position to say that they have airived at

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clear and distinct, though by no means complete, conceptions of the manner in which the great functions of assimilation, respiration, secretion, distribution of nutriment, removal of waste products, motion, sensation, and reproduction are performed, while the operation of the nervous system, as a regulative apparatus, which influences the origination and the transmission of manifestations of activity, either within itself or in other organs, has been largely elucidated.

I have pointed out, in an earlier part of this essay, that the listory of all branches of science proves that they must atten a considerable stage of development before they yield practical "fruits" and this is emmently true of physiology It is only within the present epoch. that physiology and chemistry have reached the point at which they could offer a scientific foundation to agriculture and it is only within the present epoch that zoology and physiology have yielded any very great aid to pathology and hygiene But within that time they have already rendered highly important services by the exploration of the phenomena of parasitism. Not only have the lustory of the animal parasites, such as the tapeworms and the trichma, which infest men and animals, with deadly results been cleared un by means of experimental investigations, and efficient modes of prevention deduced from the data so obtained but the terrible agency of the parasitic tough and of the infinitesimally name nucrobes which work far greater havor among plants and animals, has been brought to light The "particulate" or 'geim" theory of disease, as it is called, long since suggested, has obtained a firm foundation, in so far as it has been proved to be true in respect of sundry epidemic disorders. Moreover, it has theoretically justified prophylactic measures, such as vaccination, which formerly rested on a merely empurcal basis, and it has been extended to other diseases with excellent Further, just as the discovery of the results cause of scables proved the absurdaty of many of the old prescriptions for the prevention and treatment of that disease, so the discovery of the cause of splenic fever and other such maladies, has given a new direction to prophylactic and curative measures against the worst scourges of humanity Unless the fanaticism of philozoic sentiment overpowers the roice of philanthropy and the love of dogs and cats super-edes that of one's neighbour, the progress of experimental physiology and pathology will, indubitably, in course of time, place medicine and hygicine upon a rational basis. Two centuries ago England was devastated by the plague, cleanliness and common sense were enough to free as from its ravages. One century since, small-pox was almost as great a scourge, science, though working empirically and almost in the dark, has reduced that end to relative insignificance. At the present time, science, working in the light of clear knowledge, has attacked splenic fever and has beaten it, it is attacking hydrophobia with no mean promise of success, sooner or later it will deal, in the same way, with diphtheria, typhoid and scarlet fever. To one who has seen half a street swept clear of its children or has lost his own by these hornble pestulences, passing one's offspring through the fire to Moloch seems humanity, compared with the proposal to deprive them of half their chances of health and life because of the discomfort to dogs and cats, rabbits and frogs, which may be involved in the search for means of guarding them

An immense extension has been effected in our knowledge of the distribution of plants and animals and the elucidation of the causes which have brought about that distribution has been The establishment of metcorgreatly advanced ological observations by all civilised nations, has furnished a solid foundation to climatology, while a growing sense of the importance of the influence of the 'struggle for existence" affords a wholesome check to the tendency to overrate the influence of climate on distribution peditions, such as that of the "Challenger," equipped, not for geographical exploration and discovery, but for the purpose of throwing light on problems of physical and biological science have been sent out by our own and other Governments and have obtained stores of information of the greatest value. For the first time, we are in possession of something like precise knowledge of the physical features of the deep seas, and of the living population of the floor of the ocean. The careful and exhaustive study of the phenomena presented by the accumulations of snow and ice, in polar and mountainous regions, which has taken place in our time, has not only revealed to the geologist an agent of demulation and transport, which has slowly and quietly produced effects, formerly confidently referred to diluvial catastrophes, but it has suggested new methods of accounting for various puzzling facts of distribution.

Palæontology, which treats of the extinct forms of hie and their succession and distribution upon our globe, a branch of science which could hardly be said to exist a century ago, has undergone a wonderful development in our epoch. In some groups of animals and plants, the extinct representatives, aheady known, we more numerous and important than the living There can be no doubt that the existing Fauna and Flora is but the last term of a long series of equally numerous contemporary species, which have succeeded one another, by the slow and gradual substitution of species for species, in the vast interval of time which has elapsed between the deposition of the earliest fossiliferous strata and the present day.

There is no reasonable gro n I for believing that the oldest remains vet obtained carry as even near the beginnings of life. The impressive warnings of Livell against linsty speculations, based upon negative evidence, have been fully justified, time after time, highly organised types have been discovered in formations of an ago in which the existence of such forms of life had been coundently declared to be impossible. The western territories of the United States alone have yielded a world of extinct animal forms, undreamed or fifry years ago. And wherever sufficiently numerous series of the remains of any given group, which has endured for a long space of time, are carefully examined, their morphological relations are never m discordance with the requirements of the doctrine of evolution and often afford convincing evidence of it. At the same time it has been shown that certain forms persist with very little change, from the oldest to the newest tossiliferous formations, and thus show that progressive derelapment is a contingent, and not a necessary, result of the nature of living matter

Geology is, as it were the biology of our planet as a whole. In so far as it comprises the surface configuration and the inner structure of the earth it answers to morphology, in so far as it studies changes of condition and then causes, it corresponds with physiology in so far as it deals with the causes which have effected the progress of the

earth from its earliest to its present state, it forms part of the general doctrine of evolution An interesting contrast between the geology of the present day and that of half a century ago, is presented by the complete emancipation of the modern geologist from the controlling and perverting influence of theology, all-powerful at the earlier date As the geologist of my young days wrote, he had one eye upon fact and the other on Genesis at present, he wisely keeps both eyes on fact, and ignores the pentateuchal mythology altogether The publication of the "Principles of Geology brought upon its illustrious author a period of social ostiacism the instruction given to our children is based upon those principles Whewell had the courage to attack Lyell's fundamental assumption (which surely is a dictate of common sense) that we ought to exhaust known causes before seeking for the explanation of geological phenomena in causes of which we have no experience But geology has advanced to its present state by working from Lyell's 1 axiom. and, to this day the record of the stratified rocks affords no proof that the intensity or the rapidity of action of the causes of change has ever varied between wider limits than those between which



<sup>&</sup>lt;sup>1</sup> Perhaps I ought rather to say Buffon's axiom. For that great naturalist and writer embodied the principles of sound geology in a pithy phrase of the *Theoric de la Terre*. 'Pour juger de ce qui est airivé, et même de ce qui urriveia, nous n'avons qu'a examinei ce qui arrive.'

the operations of Nature have taken place in the youngest geological epochs

An incalculable benefit has accrued to geological science from the accurate and detailed surveys, which have now been executed by skilled geologists employed by the Governments of all In geology, the parts of the civilised world study of large maps is as important as it is said to be in politics, and sections, on a true scale, are even more important, in so far as they are essential to the apprehension of the extraordinary insignificance of geological perturbations in relation to the whole mass of our planet. It should never be forgotten that what we call "catastrophes," are, in relation to the earth, changes the equivalents of which would be well represented by the development of a few pumples, or the scratch of a pin, on a man's head. Vast regions of the earth's surface remain geologically unknown, but the area already famly explored is many times greater than it was in 1837, and, in many parts of Europe and the United States, the structure of the superficial crust of the earth has been investigated with great nunuteness

The parallel between Biology and Geology, which I have drawn, is further illustrated by the modern growth of that branch of the science known as Petrology, which answers to Histology, and has made the microscope as essential an instrument to the geological as to the biological investigator.

The evidence of the importance of causes now in operation has been wonderfully enlarged by the study of glacial phænomena, by that of earthquakes and volcanoes, and by that of the efficacy of heat and cold, wind, rain, and rivers as agents of denudation and transport. On the other hand the exploration of coral reefs and of the deposits now taking place at the bottom of the great oceans, has proved that, in animal and plant life, we have agents of reconstruction of a potency hitherto unsuspected.

There is no study better fitted than that of geology to impress upon men of general culture that conviction of the unbroken sequence of the order of natural phænomena, throughout the duration of the universe, which is the great, and perhaps the most important, effect of the increase of natural knowledge.

If desire to e piess my obligations to Messis. Smith, Elder and Co for their conteous permission to reprint this essay from . The Brigh of Queen Victoria ?]

## III

## ON THE PHYSICAL BASIS OF LIFE!

## [1868]

In order to make the title of this discourse generally intelligible, I have translated the term "Protoplasm," which is the scientific name of the substance of which I am about to speak, by the words 'the physical basis of life." I suppose that, to many, the idea that there is such a thing as a physical basis, or matter, of life may be novel—

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The substance of this paper was contained in a discourse which was delivered in Edinburgh on the evening of Sunday, the 8th of November 1868—being the first of a series of Sunday evening addresses upon non-theological topics, instituted by the Rev J Cranbrook. Some phiases, which could possess only a transitory and local interest have been contied, instead of the newspaper report of the Archbishop of York saddless, his Grace's subsequently published paniphlet. On the Limits of Philosophical Inquiry is quoted, and I have, here and there, endeavoured to express my meaning more fully and clearly than I seem to have done in speaking—if I may judge by sunday criticisms upon what I am supposed to have said, which have appeared. But in substance, and, so far as my recollection serves, in form what is here written corresponds with what was there said.

so widely spread is the conception of life as a something which works through matter, but is independent of it, and even those who are aware that matter and life are inseparably connected, may not be prepared for the conclusion plainly suggested by the phrase, "the physical basis or matter of life," that there is some one kind of matter which is common to all living beings, and that their endless diversities are bound together by a physical, as well as an ideal, unity. In fact, when first apprehended, such a doctrine as this appears almost shocking to common sense.

What, truly, can seem to be more obviously different from one another, in faculty, in form, and in substance, than the various kinds of living beings? What community of faculty can there be between the brightly-coloured lichen, which so nearly resembles a mere mineral incrustation of the bare rock on which it grows, and the painter, to whom it is instinct with beauty or the botanist, whom it feeds with knowledge?

Again, think of the microscopic fungus—a more infinitesimal evoid particle, which finds space and duration enough to multiply into countless millions in the body of a living fly, and then of the wealth of foliage, the luxuriance of flower and fruit, which lies between this bald sketch of a plant and the giant pine of California, towering to the dimensions of a cathedral spire, or the Indian fig, which covers acres with its profound shadow, and

endures while nations and empires coine and go around its vast cucumference. Or, turning to the other half of the world of life picture to yourselves the great Finner whale, hugest of beasts that live. or have lived, disporting his eighty or ninety feet of bone, muscle, and blubber, with easy toll, among waves in which the stoutest slip that ever left dockyard would flounder hopelessly, and contrast him with the invisible animalculesmere gelatinous specks, multitudes of which could, in fact, dance upon the point of a needle with the same case as the angels of the Schoolinen could, in imagination. With these images before your minds, you may well ask, what community of form, or structure, is there between the animalcule and the whale, or between the fungus and the fig-tree? And, à fortions, between all four?

Finally, if we regard substance or material composition, what hidden bond can connect the flower which a girl wears in her han and the blood which courses through her youthful verisor, what is there in common between the dense and resisting mass of the oak, or the strong fabric of the tortoise, and those broad lisks of glassy jelly which may be seen pulsating through the waters of a calm sea but which drain away to mere films in the hand which raises them out of their element?

Such objections as these must, I think, arise in the mind of every one who ponders, for the first time, upon the conception of a single physical basis of life underlying all the diversities of vital existence, but I propose to demonstrate to conthat, notwithstanding these apparent difficulties a threefold unity—namely, a unity of power or faculty, a unity of form, and a unity of substantial composition—does pervade the whole living world.

No very abstruse argumentation is needed, in the first place to prove that the powers, or faculties, of all kinds of hving matter, diverse as they may be in degree are substantially similar in kind

Coethe has condensed a survey of all powers of mankind into the well-known epigram —

"Warum tieibt sich das Volk so und schiert" Es will sieh einahren

Kinder rengen und die nilmen so gut es vermag

Weiter bringt +3 kam Mensch stell' ar sich wie er auch will '

In physiological language this means, that all the multifarious and complicated activities of man are comprehensible under three categories. Either they are immediately directed towards the maintenance and development of the body, or they effect transitory changes in the relative positions of parts of the body, or they tend towards the continuance of the species. Even those manifestations of intellect, of feeling, and of will, which

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we rightly name the higher faculties, are not excluded from this classification, maximuch as to every one but the subject of them, they are known only as transitory changes in the relative positions of parts of the body Speech, gesture, and every other form of human action are, in the long run. resolvable into muscular contraction, and muscular contraction is but a transitory change in the relative positions of the parts of a muscle the scheme which is large enough to embrace the activities of the highest form of life, covers all those of the lower creatures The lowest plant, or animalcule, feeds, grows, and reproduces its kind In addition, all animals manifest those transitory changes of form which we class under unitability and contractility, and, it is more than probable, that when the vegetable world is thoroughly explored, we shall find all plants in possession of the same powers, at one time or other of their existence

I am not now alluding to such phænomena, at once rare and conspicuous, as those exhibited by the leaflets of the sensitive plants or the stamens of the barberry, but to much more widely spread, and at the same time, more subtle and hidden manufestations of vegetable contractility. You are doubtless aware that the common nettle owes its stinging property to the mnumerable stiff and needle-like, though exquisitely delicate hairs which cover its surface. Each stinging-needle tapers from a broad

hase to a slender summer, which though rounded in the end, is of such microscopic flueness that it readily penetrates and breaks off in the skin The whole han consists of a very delicate onter case of wood, closely applied to the inner surface of which is a layer of semifluid matter, full of innumerable granules of extreme minuteness senn-fluid lining is protoplasm, which thus constitutes a kind of bag, full of a lumpid liquid, and roughly corresponding in form with the interior of the han which it fills When viewed with a sufficiently high magnifying power, the protoplasmic layer of the nettle hair is seen to be in a condition of unceasing activity Local contractions of the whole thickness of its substance pass slowly and gradually from point to point, and give rise to the appearance of progressive waves, just as the bending of successive stalks of coin by a breeze produces the apparent billows of a cornfield

But, in addition to these movements and independently of them, the granules are driven, in relatively rapid streams, through channels in the protoplasm which seem to have a considerable amount of persistence. Most commonly the currents in adjacent parts of the protoplasm take similar currections and, thus there is a general stream up one side of the hair and down the other. But this does not prevent the existence of partial currents which take different routes; and some-



times trains of granules may be seen coursing swiftly in opposite directions within a twenty-thousaudth of an inch of one another, while occasionally, opposite streams come into direct collision, and, after a longer or shorter struggle, one predominates. The cause of these currents seems to lie in contractions of the protoplasm which bounds the channels in which they flow, but which are so minute that the best microscopes show only their effects, and not themselves.

The spectacle attorded by the worderful energies prisoned within the compass of the nucroscopic hair of a plant, which we commonly regard as a merely passive organism, is not easily forgotten by one who has watched its display, continued hour after hour, without pause or sign of weaken-The possible complexity of mary other organic forms, seemingly as simple as the protoplasm of the nottle, dawns upon one, and the comprison of such a protoplasm to a body with on internal circulation, which has been put forward by an eminent physiologist, loses much of its startling character. Currents similar to those of the hairs of the nettle have been observed in a great multitude of very different plants, and weighty authorsties have suggested that they probably occur, in more or less perfection, in all young vegetable It such be the case, the wonderful mounday silence of a tropical forest is after all, due only to the dulness of our hearing, and could our ears

eatch the murmum of these tiny Maelstroms as they which in the immunerable mynads of high cells which constitute each tree we should be runned, as with the roar of a great city

Among the lower plants, it is the rule rather than the exception, that contractility should be still more openly mainfested at some periods of their existence The protoplasm of Algu and Freign becomes, under many circumstances, partially, or completely, freed from its woody case, and exhibits movements of its whole mass or is propelled by the contractility of one or more, han-like prolongations of its body, which are called vibratile otha-And, so far as the conditions of the manifestation of the phænomena of contractility have yet been studied, they are the same for the plant as for the animal. Heat and electric shocks influence both. and in the same way, though it may be in different degrees. It is by no means my intention to suggest that there is no difference in faculty between the lowest plant and the highest, or between plants and animals But the difference between the powers of the lowest plant, or animal, and those of the highest, is one of degree, not of kind, and depends, as Milne-Edwards long ago so well pointed out, upon the extent to which the principle of the division of labour is carried out in the living economy. In the lowest organism all parts are competent to perform all functions, and one and the same portion of protoplasm may



successfully take on the function of feeding, moving, or reproducing apparatus. In the highest on the contrary, a great number of parts combine to perform each function, each part doing its allotted share of the work with great accuracy and efficiency, but being useless for any other purpose

On the other hand, notwithstanding all the fundamental resemblances which exist between the powers of the protoplasm in plants and in animals, they present a striking difference (to which I shall advert more at length presently), in the fact that plants can manufacture fiesh protoplasm out of mineral compounds, whereas animals are obliged to produce it ready made and hence, in the long run, depend upon plants. Upon what condition this difference in the powers of the two great divisions of the world of life depends, nothing is at present known.

With such qualifications as anses out of the last-mentioned fact, it may be truly said that the acts of all living things are fundamentally one. Is any such unity predicable of their forms? Let us seek in easily verified facts for a reply to this question. It a drop of blood be drawn by pricking one's finger, and viewed with proper precautions, and under a sufficiently high inicroscopic power, there will be seen, among the innumerable multitude of little circular, discordal bodies, or corpuscles, which float in it and give it its colour, a

comparatively small number of colouless corpuscles of somewhat larger size and very megular shape. It the drop of blood be kept at the temperature of the body, these colouless corpuscles will be seen to exhibit a marvellous activity, changing their forms with great rapidity, drawing in and thrusting out prolongations of their substance, and creeping about as if they were independent organisms

The substance which is thus active is a mass of protoplasm, and its activity differs in detail, rather than in principle, from that of the protoplasm of Under sundry circumstances the corpuscle dies and becomes distended into a round mass, in the mulst of which is seen a smaller spherical body, which existed, but was more or less hidden, in the living corpuscle, and is called its nucleus Corpuscles of essentially similar structure are to be found in the skin, in the hning of the mouth, and scattered through the whole framework of the body Nay, more, in the earliest condition of the human organism in that state in which it has but just become distinguishable from the egg in which it arises, it is nothing but an aggregation of such corpuscles and every organ of the body was once, no more than such an aggregation

Thus a nucleated mass of protoplasm turns out to be what may be termed the structural unit of the human body As a matter of fact, the body, in its earliest state, is a more multiple of such units and in its perfect condition, it is a multiple of such units, variously modified

But does the formula which expresses the essential structural character of the highest animal cover all the rest as the statement of its powers and faculties covered that of all others? Very nearly Beast and fowl, reptile and tish, mollusk, worm, and polype, are all composed of structural units of the same character, namely, masses of protoplasm with a nucleus. There are sundry very low animals, each of which, structurally, is a mere colourless blood-corpuscle, leading an independent life But, at the very bottom of the animal scale even this simplicity becomes simplified, and all the phænomena of life are manifested by a particle of protoplasm without a nucleus Nor are such organisms insignificant by reason of then want of complexity. It is a fair question whether the protoplasm of those simplest forms of life which people an immense extent of the bottom of the sea, would not outweigh that of all the higher living beings which inhabit the land put And in ancient times, no less than at the present day, such living beings as these have been the greatest of lock builders

What has been said of the animal world is no less true of plants. Imbedded in the protoplasm at the broad, or attached, end of the nettle hair, there has a spheroidal nucleus. Careful examina-

tion further proves that the whole substance of the nettle is made up of a repetition of such masses of nucleated protoplasm, each contained in a wooden case, which is inodified in form, sometimes into a woody fibre, sometimes into a duct or spiral vessel, sometimes into a pollen grain or an ovule. Traced back to its earliest state, the nettle arises as the man does, in a particle of nucleated protoplasm. And in the lowest plants as in the lowest animals, a single mass of such protoplasm may constitute the whole plant, or the protoplasm may exist without a nucleus.

Under these circumstances it may well be asked, how is one mass of non-nucleated protoplasm to be distinguished from another? why call one plant "and the other 'animal" !

The only reply is that, so tal as form is concerned, plants and animals are not separable, and that, in many cases it is a mere matter of concention whether we call a given organism an animal or a plant. There is a living body called \*\*Ethalium septicum\*, which appears upon decaying vegetable substances, and, in one of its forms, is common upon the surfaces of tan-pits. In this condition it is, to all intents and purposes, a fungus, and formerly was always regarded as such but the remarkable investigations of De Bary have shown that, in another condition, the \*\*Ethalium\* is an actively locomotive creature, and



takes in solid matters, upon which, apparently, it feeds, thus exhibiting the most characteristic feature of animality. Is this a plant, or is it an animal. Is it both, or is it neither? Some decide in favour of the last supposition, and establish an intermediate kingdom, a sort of biological No Man's Land for all these questionable forms. But, as it is admittedly impossible to draw any distinct boundary line between this no man's land and the vegetable would on the one hand, or the animal, on the other, it appears to me that this proceeding merely doubles the difficulty which, before, was single.

Protoplasm, simple or nucleated, is the formal basis of all life. It is the clay of the potter which, bake it and paint it as he will, remains clay separated by artifice, and not by nature, from the commonest back or sun-dried clod.

Thus it becomes clear that all living powers are cognate, and that all living forms are fundamentally of one character. The researches of the chemist have revealed a no less striking uniformity of material composition in living matter

In perfect strictness, it is true that chemical investigation can tell us little or nothing, directly of the composition of living matter, maximuch as such matter must needs die in the act of analysis,—and upon this very obvious ground, objections, which I contess seem to me to be somewhat frivolous, have been raised to the drawing of any conclusions

whatever respecting the composition of actually hving matter, from that of the dead matter of life, which alone is accessible to us nectors of this class do not seem to reflect that it is also, in strictness, true that we know nothing about the composition of any body whatever as The statement that a crystal of calc-spar consists of carbonate of lime is quite true, if we only mean that, by appropriate processes, it may be resolved into carbonic acid and quicklime pass the same eachome and over the very quickline thus obtained, you will obtain carbonate of line again, but it will not be calc-spar, nor anything like it. Can it, therefore, be said that chemical analysis teaches nothing about the chemical composition of calc-quar? Such a statement would be absurd, but it is haidly more so thru the talk one occasionally hears about the uselessness of applying the results of chemical analysis to the living bodies which have yielded theia

One fact, at any rate, is out of reach of such refinements, and this is, that all the forms of protoplasm which have yet been examined contain the four elements, carbon hydrogen, oxygen, and introgen, in very complex union and that they behave similarly towards several reagents. To this complex combination, the nature of which has never been determined with exactness, the name of Protein has been applied. And if we use this



term with such caution as may properly arise out of our comparative ignorance of the things for which it stands, it may be truly said, that all protoplasm is motomaceous, or, as the white, or albumen, of an egg is one of the commonest examples of a nearly pure proteine matter, we may say that all living matter is more or less albuminoid

Perhaps it would not yet be safe to say that all forms of protoplasm are affected by the direct action of electric shocks, and yet the number of cases in which the contraction of protoplasm is shown to be affected by this agency increases every day

Not can it be affirmed with perfect confidence, that all torms of protoplasm are liable to undergo that peculiar coagulation at a temperature of 40° -50° centigrade, which has been called 'heatstiffening," though Kuhne's beautiful researches have proved this occurrence to take place in so many and such diverse living beings, that it is hardly rash to expect that the law holds good for all.

Enough has, perhaps, been said to prove the existence of a general uniformity in the character of the protoplasm or physical basis, of life, in whatever group of living beings it may be studied But it will be understood that this general uniformity by no means excludes any amount of special modifications of the fundamental substance. The immeral, carbonate of line, assumes an immerse diversity of characters, though no one doubts that, under all these Protean changes, it is one and the same thing.

And now, what is the ultimate fate, and what the origin, of the matter of life?

Is it, as some of the older naturalists supposed, diffused throughout the universe in molecules, which are indestructible and unchangeable in themselves, but in ordless transmigration, unite in immunerable permutations, into the diversified forms of life we know? Or is the matter of life composed of ordinary matter, differing from it only in the minner in which its atoms are aggregated? Is it built up of ordinary matter, and again resolved into ordinary matter when its work is done?

Modern science does not hesitate a moment between these alternatives Physiology writes over the portals of life—

## Debemui morti no- nostragae,'

with a profounder meaning than the Roman poet attached to that melancholy line. Under whatever disguise it takes refuge, whether fungus or oak, worm or man, the living protoplasm not only ultimately dies and is resolved into its mineral and lifeless constituents, but is always dying, and, strange as the paradox may sound, could not live unless it died.

VOL. I

In the wonderful story of the "Peau de Chagim," the hero becomes possessed of a magical wild ass' skin, which yields him the means of gratifying all his wishes. But its surface represents the duration of the proprietor's life, and for every satisfied desire the skin shinks in proportion to the intensity of fruition, until at length life and the last handbreadth of the peau de chagrin, disappear with the gratification of a last wish

Balzae's studies had led him over a wide range of thought and speculation, and his shadowing forth of physiological truth in this strange story may have been intentional. At any rate, the matter of life is a veritable provide chagrin, and for every vital act it is somewhat the smaller. All work implies waste, and the work of life results, directly or indirectly, in the waste of protoplasm.

Every word uttered by a speaker costs him some physical loss, and, in the strictest sense, he burns that others may have light—so much eloquence, so much of his body resolved into carbonic acid, water, and usea. It is clear that this process of expenditure cannot go on for ever But, happily, the protoplasmic peau de chagrin differs from Balzac's in its capacity of being repaired, and brought back to its full size, after every exertion

For example, this present lecture, whatever its intellectual worth to you, has a certain physical value to me, which is, conceivably, expressible by

the number of grams of protoplasm and other bodily substance wasted in maintaining my vital processes during its delivery. My preu de chagren will be distinctly smaller at the end of the discourse than it was at the beginning. By and by, I shall probably have recourse to the substance commonly called mutton, for the purpose of stretching it back to its original size. Now this mutton was once the living protoplasm, more or less modified, of another animal—a sheep. As I shall eat it, it is the same ruatter altered, not only by death, but by exposure to sandry artificial operations in the process of cooking.

But these changes, whatever be their extent, have not rendered it incompetent to resume its old functions as matter of life. A singular inward laboratory, which I possess, will dissolve a certain portion of the modified protoplasm the solution so formed will pass into my veins, and the subtle influences to which it will then be subjected will convert the dead protoplasm into living protoplasm, and transubstantiate sheep into man

Nor is this all. If digestion were a thing to be trifled with, I might sup upon lobster, and the matter of life of the crustacean would undergo the same wonderful metamorphosis into humanity And were I to return to my own place by sea, and undergo shipwreck, the crustacean might, and probably would return the compliment, and demonstrate our common nature by tuning my

protoplasm into living lobster. Or, if nothing better were to be had I might supply my wants with mere bread, and I should find the protoplasm of the wheat-plant to be convertible into man, with no more trouble than that of the sheep, and with far less, I fancy, than that of the lobster

Hence it appears to be a matter of no great moment what animal, or what plant, I lay under contribution for protoplasm, and the fact speaks volumes for the general identity of that substance m all living beings. I share this catholicity of assimilation with other animals, all of which, so far as we know, could thrive equally well on the protoplasm of any of then fellows, or of any plant; but here the assimilative powers of the animal world cease A solution of smelling-salts in water, with an infinitesimal proportion of some other saline matters, contains all the elementary bodies which enter into the composition of protoplasm, but, as I need hardly say, a hogshead of that fluid would not keep a hungry man from starving, nor would it save any animal whatever from a like fate. An animal cannot make protoplasm, but must take it ready-made from some other animal, or some plant—the animal's highest feat of constructive chemistry being to convert dead protoplasm into that living matter of life which is appropriate to itself.

Therefore, in seeking for the origin of piotoplasm, we must eventually turn to the vegetable world A fluid containing carbonic acid water, and nitrogenous salts, which offers such a Barmecide feast to the animal, is a table richly spread to multitudes of plants, and, with a due supply of only such materials, many a plant will not only maintain itself in vigour but grow and multiply until it has increased a million-fold, or a million million-fold, the quantity of protoplasm which it originally possessed in this way building up the matter of life to an indefinite extent, from the common matter of the universe

Thus, the animal can only raise the complex substance of dead protoplasm to the higher power, as one may say, of living protoplasm; while the plant can raise the less complex substances carbonic acid water, and introgenous salts—to the same stage of living protoplasm, if not to the same level But the plant also has its limitations Some of the fungi, for example, appear to need higher compounds to start with, and no known plant can live upon the uncompounded elements of protoplasm. A plant supplied with pure carbon, hydrogen, oxygen, and mitrogen, phosphorus, sulphur and the like, would as infallibly die as the animal in his bath of smelling-salts, though it would be surrounded by all the constituents of protoplasm. Nor, indeed need the process of simplification of vegetable food be carried so far as this, in order to arrive at the limit of the plant's thaumatingy Let water, carbonic acid, and all

the other needful constituents be supplied except introgenous salts and an ordinary plant will still be unable to manufacture protoplasm.

Thus the matter of life, so far as we know it (and we have no right to speculate on any other), breaks up, in consequence of that continual death which is the condition of its manifesting vitality, into carbonic acid, water, and introgenous compounds, which certainly possess no properties but those of ordinary matter. And out of these same forms of ordinary matter, and from none which are simpler, the vegetable world builds up all the protoplasm which keeps the animal world a-going Plants are the accumulators of the power which animals distribute and disperse

But it will be observed, that the existence of the matter of life depends on the pre-existence of certain compounds, namely, carbonic acid, water. and certain introgenous bodies. Withdraw any one of these three from the world and all vital pliænomena come to an end They are as necessary to the protoplasm of the plant, as the protoplasm of the plant is to that of the animal Carbon, hydrogen oxygen, and nitrogen are all lifeless bodies Of these, carbon and oxygen unite in certain proportions and under certain conditions to give rise to carbonic acid, hydrogen and oxygen produce water, nitrogen and other elements give use to nitrogenous salts. These new compounds, like the elementary bodies of which they are

composed, are lifeless. But when they are brought together, under certain conditions, they give use to the still more complex body, protoplasm, and this protoplasm exhibits the phænomena of life

I see no break in this series of steps in molecular complication, and I am unable to understand why the language which is applicable to any one term of the series may not be used to any of the others. We think fit to call different kinds of matter carbon, oxygen, hydrogen, and introgen, and to speak of the various powers and activities of these substances as the properties of the matter of which they are composed.

When hydrogen and oxygen are mixed in a certain proportion, and an electric spark is passed through them, they disappear, and a quantity of water, equal in weight to the sum of their weights, appears in their place There is not the slightest parity between the passive and active powers of the water and those of the oxygen and hydrogen which have given rise to it At 32' Fahrenheit, and far below that temperature, oxygen and hydrogen are clastic gaseous bodies, whose particles tend to rush away from one another with great force Water, at the same temperature, is a strong though brittle solid, whose particles tend to cohere into definite geometrical shapes, and sometimes build up frosty initiations of the most complex forms of vogetable foliage

Nevertheless we call these and many other

strange phænomena, the properties of the water, and we do not hesitate to believe that, in some way or another, they result from the properties of the component elements of the water We do not assume that a something called "aquosity" entered into and took possession of the oxidated hydrogen as soon as it was formed, and then guided the aqueous particles to their places in the facets of the crystal, or amongst the leaflets of the hoarfrost On the contrary, we live in the hope and in the faith that, by the advance of molecular physics, we shall by and by be able to see our way as clearly from the constituents of water to the properties of water, as we are now able to deduce the operations of a watch from the form of its parts and the manner in which they are put together

Is the case in any way changed when carbonic acid, water, and nitrogenous salts disappear, and in their place, under the influence of pre-existing living protoplasm, an equivalent weight of the matter of life makes its appearance?

It is true that there is no sort of parity between the properties of the components and the properties of the resultant, but neither was there in the case of the water. It is also true that what I have spoken of as the influence of pre-existing living matter is something quite unintelligible, but does anybody quite comprehend the modus operands of an electric spark, which traverses a mixture of oxygen and hydrogen?

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What justification is there, then, for the assumption of the existence in the living matter of a something which has no representative or correlative, in the not living matter which gave rise to it? What better philosophical status has 'vitality' than "aquosity"? And why should 'vitality' hope for a better fate than the other 'itys' which have disappeared since Martinus Scriblerus accounted for the operation of the meat-jack by its inherent 'meat-roasting quality," and scorned the 'materialism' of those who explained the turning of the spit by a certain mechanism worked by the draught of the chimney.

If scientific language is to possess a definite and constant signification whenever it is employed, it seems to me that we are logically bound to apply to the protoplasm, or physical basis of life, the same conceptions as those which are held to be legitimate observer. If the phanomena exhibited by water are its properties, so are those presented by protoplasm living or dead its properties.

If the properties of water may be properly said to result from the nature and disposition of its component molecules, I can find no intelligible ground for refusing to say that the properties of protoplasm result from the nature and disposition of its molecules

But I bid you beware that, in accepting these conclusions, you are placing you feet on the first

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rung of a ladder which, in most people's estimation, is the reverse of Jacob's, and leads to the antipodes of heaven. It may seem a small thing to admit that the dull vital actions of a fungus, or a foraumitter, are the properties of their protoplasm, and are the direct results of the nature of the matter of which they are composed as I have endeavoured to prove to you, then protoplasm is essentially identical with, and most readily converted into, that of any animal, I can discover no logical halting-place between the admission that such is the case and the further concession that all vital action may, with equal propriety, be said to be the result of the molecular torces of the protoplasm which displays it And if so it must be true, in the same sense and to the same extent, that the thoughts to which I am now giving utterance, and your thoughts regarding them are the expression of nielecular changes in that matter of life which is the source of our other vital phænomena

Past experience leads no to be tolerably certain that, when the propositions I have just placed before you are accessible to public comment and criticism, they will be condemned by many zealous persons, and perhaps by some few of the wise and thoughtful. I should not wonder it "gross and brutal materialism" were the middest phrase applied to them in certain quarters. And, most

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undoubtedly, the terms of the propositions are distinctly materialistic. Nevertheless two things are certain; the one, that I hold the statements to be substantially true, the other, that I, individually, am no materialist but, on the contrary believe materialism to involve grave philosophical error

This union of materialistic ferminology with the repudiation of materialistic philosophy I share with some of the most thoughtful men with whom I am acquainted. And, when I first undertook to deliver the present discourse, it appeared to me to be a fitting opportunity to explain how such a union is not only consistent with, but necessitated by sound logic. I purposed to lead you through the territory of vital phanomena to the materialistic slough in which you find yourselves now plunged, and then to point out to you the sole path by which in my judgment, extracation is possible.

An occurrence of which I was unaware until my arrival here last night renders this line of argument singularly opportune. I found in your papers the cloquent address. On the Limits of Philosophical Inquiry," which a distinguished prelate of the English Church delivered before the members of the Philosophical Institution on the previous day. My argument also, turns upon this very point of the limits of philosphical inquiry, and I cannot bring out my own views better than by contrasting them with those so plainly and, in

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the main, fauly stated by the Archbishop of York

But I may be permitted to make a preliminary comment upon an occurrence that greatly astonished me. Applying the name of the "New Philosophy" to that estimate of the limits of philosophical inquiry which I, in common with many other men of science, hold to be just, the Archbishop opens his address by identifying this "New Philosophy" with the Positive Philosophy of M. Comte (of whom he speaks as its "founder"), and then proceeds to attack that philosopher and his doctures vigorously

Now, so far as I am concerned, the most reverend prelate might dialectically how M Comto in pieces, as a modern Agag, and I should not attempt to stay his hand. In so far as my study of what specially characterises the Positive Philosophy has led me, I find therein little or nothing of any scientific value, and a great deal which is as thoroughly antagonistic to the very essence of science as anything in ultramontanc Catholicism. In fact M Comte's philosophy, in practice might be compendiously described as Catholicism manus Christianity.

But what has Comusin to do with the "New Philosophy," as the Aichlishop defines it in the following passage?

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<sup>&#</sup>x27; Let me buelly remind you of the leading principles of this new philosophy

· All knowledge is experience of facts acquired by the senses. The traditions of older philosophies have obstured our capetience by muring with it much that the senses council coserve, and until these additions are discuided our knowledge in impure Thus metaphysics tell us that one fact which we observe is a cause, and another is the effect of that cause, but, upon a rigid analysis, we find that our senses observe nothing of cause or effect they observe, first, that one fact succeeds another, and, after some opportunity, that this fact has never failed to follow —that for cause and effect we should substitute invariable surcession. An older philosophy teaches us to define an object by distinguishing its essential from its accidental qualifics but experience knows nothing of essential and accidental she sees only that certain makes attach to an object, and, after many observations, that some of them attach are analy whilst others may at rimes be absent As all knowledge is releave, the notion of anything being necessary must be I anish I with other trolitions 1

There is much here that expresses the spirit of the "New Philosophy," if by that term be meant the spirit of modern science, but I cannot but marvel that the assembled wisdom and learning of Edinburgh should have uttered no sign of dissent, when Cointe was declared to be the founder of these doctrines. No one will accuse Scotchmen of habitually forgetting their great countryinen, but it was enough to make David Hume turn in his grave, that here, almost within ear-shot of his house, an instructed rudience should have listened, without a mumui, while his most characteristic documes were attributed to a

<sup>1</sup> The Limits of Philosophical I way, pp 1 and 5.

French writer of fifty years later date, in whose dreary and verbose pages we miss able the vigorr of thought and the exquisite clearness of style of the man whom I make bold to term the most acute thinker of the eighteenth century—even though that century produced Kant

But I did not come to Scotland to vindicate the honom of one of the greatest men she has ever produced. My business is to point out to you that the only way of escape out of the 'crass materialism" in which we just now landed is the adoption and starct working-out of the very principles which the Archbishop holds up to reprobation

Let us suppose that knowledge is absolute, and not relative and therefore, that our conception of matter represents that which it really is suppose, further, that we do know more of cause and effect than a certain definite order of succession among tacts, and that we have a knowledge of the necessity of that succession-and hence, of necessary laws-and I, for my part, do not see what escape there is from utter materialism and necessamanism For it is obvious that our knowledge of what we call the material would is, to begin with, at least as certain and definite as that of the spiritual world, and that our acquaintance with law is of as old a date as our knowledge of spontaneity Further, I take it to be demonstrable that it is utterly impossible to prove that anything whatever may not be the effect of a material and necessary cause, and that human logic is equally incompetent to prove that any act is really spontaneous A really spoutaneous act is one which, by the assumption, has no cause, and the attempt to prove such a negative as this is, on the face of the matter absurd And while it is thus a philosophical impossibility to demonstrate that any given phænomenou is not the effect of a material cause, any one who is acquainted with the history of science will admit, that its progress has, in all ages meant, and now, more than ever, means, the extension of the province of what we call matter and causation, and the concountant gradual banishment from all regions of human thought of what we call spirit and spontaneity

I have endeavoured, in the first part of this discourse, to give you a conception of the direction towards which modern physiology is tending, and I ask you, what is the difference between the conception of life as the product of a certain disposition of material molecules, and the old notion of an Archæus governing and directing blind matter within each living body, except this—that here, as elsewhere matter and law have devoured spirit and spontaneity? And as surely as every future grows out of past and present, so will the physiology of the fiture gradually extend the realm of matter and law until it is co-extensive with knowledge, with feeling, and with action

The consciousness of this great truth weighs like a nightmare, I believe, upon many of the best minds of these days. They watch what they conceive to be the progress of materialism, in such fear and powerless anger as a savage feels, when, during an echipse, the great shadow creeps over the fice of the sun. The advancing tide of matter threatens to drown their souls, the tightening grasp of law impedes their ficedom, they are alarmed lest man's moral nature be debased by the increase of his wisdom.

If the "New Philosophy' be worthy of the reprobation with which it is visited, I confess their fears seem to me to be well founded. While on the contrary, could David Hume be consulted. I think he would smile at their perplexities, and chide them for doing even as the heathen, and falling down in terror before the hideous idols their own hands have raised.

For, after all, what do we know of this terrible 'matter," except as a name for the unknown and hypothetical cause of states of our own consciousness? And what do we know of that "spirit" over whose threatened extinction by matter a great lamentation is arising, like that which was heard at the death of Pan, except that it is also a name for an unknown and hypothetical cause, or condition, of states of consciousness? In other words, matter and spirit are but names for the imaginary substrata of groups of natural phenomena.



And what is the dire necessity and ' non ' law under which men groan? Truly, most gratuitously invented bugbeaus. I suppose if there be an 'iron 'law, it is that of gravitation, and if there be a physical necessity, it is that a stone, unsupported, must fall to the ground But what is all we really know, and can know, about the latter phænomena 'Simply, that, in all human experience, stones have fallen to the ground under these conditions, that we have not the smallest reason for believing that any stone so cucumstanced will not fall to the ground, and that we have, on the contrary, every reason to believe that it will so fall It is very convenient to indicate that all the conditions of belief have been fulfilled in this case, by calling the statement that unsupported stones will fall to the ground, "a law of But when, as commonly happens, we change will into must, we introduce an idea of necessity which most assuredly does not lie in the observed facts, and has no warranty that I can discover elsewhere For my part, I utterly repudiate and anathematise the intruder know, and Law I know, but what is this Necessity, save an empty shadow of my own mind's throwing?

But, if it is certain that we can have no knowledge of the nature of either matter or spirit, and that the notion of necessity is something illegitimately thrust into the perfectly legitimate conception of law the materialistic position that there is nothing in the world but matter, force, and necessity, is as utterly devoid of justification as the most baseless of theological dogmas. The fundamental dectrines of materialism, like those of spiritualism, and most other "isms," he outside "the limits of philosophical inquity," and David Hume's great service to humanity is his urefragable demonstration of what these limits are Humo called himself a sceptic, and therefore others cannot be blamed if they apply the same title to him, but that does not alter the fact that the name with its existing implications, does him gross injustice

If a man asks me what the politics of the mhabitants of the moon are, and I toply that I do not know, that neither I, nor any one clse, has any means of knowing, and that, under these circumstances. I decline to trouble myself about the subject at all. I do not think he has any right to call me a sceptic. On the contrary in replying thus, I conceive that I am simply honest and truthful and show a proper regard for the economy So Hume's strong and subtle intellect of time takes up a great many problems about which we are naturally curious, and shows us that they are essentally questions of lunar politics, in their essence incapable of being answered and therefore not worth the attention of men who have work to do in the world And he thus ends one of his essays -

"If we take in hard any volume of Divinity, or school metaphysics, for instance let us ask, Does it contain any answerse reasoning concerning quantity or number? No Poes it entire any experimental reasoning concerning neature of fact and exist once? No Commit it then to the flames, for it can contain nothing but sophistry and illusion."

Permit me to enforce this most wise advice Why trouble ourselves about matters of which, however important they may be, we do know nothing, and can know nothing? We hive in a world which is full of misery and ignorance, and the plain duty of each and all of us is to try to make the little corner be can influence somewhat less miserable and somewhat less ignorant than it was before be entered it. To do this chectually it is necessary to be fully possessed of only two beliefs, the first, that the order of Nature is ascertainable by our faculties to an extent which is practically unlimited, the second, that our volution 2 counts for something as a condition of the course of events

Each of these beliefs can be verified experimentally, as often as we like to try. Each, therefore, stands upon the strongest foundation upon which any belief can rest, and forms one of our highest

<sup>&#</sup>x27;Hume's lesser 'Of the Admended on Sceptical Philosophy 'm the Industry contenting the Human butter-forming—[Many critics of this passage such to longer that the subject matter of Etimes and Asilistics consists of matters of fact and existence—1592]

<sup>?</sup> Or, to speak more a mutaly, the physical state of which volution is the expression - [1892]

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truths. If we find that the ascertamment of the order of nature is facilitated by using one terminology, or one set of symbols rather than another, it is our clear duty to use the former, and no harm can accide, so long as we bear in mind, that we are dealing merely with terms and symbols.

In itself it is of little moment whether we express the phenomena of matter in terms of spirit or the plazioniena of spirit in terms of matter may be regarded as a form of thought, thought may be regarded as a property of matter-each statement has a certain relative But with a view to the progress of science, the materialistic terminology is in every way to be preferred For it connects thought with the other phenomena of the universe, and suggests inquiry into the nature of those physical conditions, or concomitants of thought, which are more or less accessible to us and a knowledge of which may, in future, help us to exercise the same kind of control over the world of thought as we already possess in respect of the material world, whereas the alternative, or spiriturlistic, terminology is utterly barren, and leads to notling but obscurity and confusion of ideas

Thus there can be intile doubt, that the further science advances, the more extensively and consistently will all the phanomena of Nature be represented by materialistic formulæ and symbols But the man of science, who, forgetting the limits of philosophical inquiry, slides from these formulæ and symbols into what is commonly understood by materialism, seems to me to place himself on a level with the mathematician, who should mistake the a's and y's with which he works his problems, for real entities—and with this further disadvantage, as compared with the mathematician, that the blunders of the latter are of no practical consequence, while the errors of systematic materialism may paralyse the energies and destroy the beauty of a life

[I cannot say I have even had to complain of lack of hostile criticism, but the preceding essay has come in for more than its fair share of that commodity. It may be well, therefore, for the general reader to study, in connection with it, the first chapter of the standard 'Textbook of Physiology,' by Dr. Foster, making fair allowance for the rapid progress of knowledge during the last quarter of a century. 1892.

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ON DESCARTES: DISCOURSE TOUCHING THE METHOD OF USING ONE'S REASON RIGHTLY AND OF SEEKING SCIENTIFIC TRUTH"

## [1870]

It has been well said that all the thoughts of men, from the beginning of the world until now, are linked together into one great chain. " but the conception of the intellectual filiation of mankind which is expressed in these words may perhaps, be more fitly shadowed forth by a different metaphor. The thoughts of men scem rather to be comparable to the leaves, flowers, and fruit upon the innumerable branches of a few great stems, fed by commingled and hidden roots. These stems bear the names of the half-n-dozon men, endowed with intellects of heroic force and clearness, to whom we are led at whitever point of the world of thought the attempt to trace its

history commences, just as certainly as the following up the small twigs of a tree to the branchlets which bear them, and tracing the branchlets to their supporting branches, brings us, sooner or later, to the bole

It seems to me that the thinker who, more than any other, stands in the relation of such a stem towards the philosophy and the science of the modern world is Réné Descartes. I mean, that if you lay hold of any characteristic product of modern ways of thinking, either in the region of philosophy, or in that of science, you find the spirit of that thought if not its form, to have been present in the mind of the great Frenchman

There are some men who are counted great because they represent the actuality of their own age, and innior it as it is. Such an one was Voltaire of whom it was epigrammatically said, 'he expressed everybody's thoughts better than anybody '1. But there are other men who attain greatness because they embody the potentiality of their own day, and magically reflect the future. They express the thoughts which will be everybody's two or three centuries after them. Such an one was Descartes

Born in 1596, nearly three hundred years ago, of a noble family in Touraine, Réné Descartes grew up into a sickly and diminutive child, whosé

I forget who it was said of him — Il a plus que personne l'espirt que tout le monde a "

keen wit soon gained him that title of "the Philosopher," which in the mouths of his noble kinsmen, was more than half a reproach. The best schoolmasters of the day the Jesuits, educated him as well as a French hoy of the seventeenth century could be educated. And they must have done then work honestly and well, for, before his schoolboy days were over, he had discovered that the most of what he had learned, except in mathematics, was devoid of solid and real value.

Therefore," says he, in that 'Discourse' which I have taken for my rext. "as soon is I was old enough to be set free from the government of my teachers, I entirely for sook the study of lutters," and determining to seek no other knowledge than that which I could discover within myselt, or in the great book of the world, I spent the remainder of my youth m travelling, in seeing courts and armies, in the society of people of different humons and conditions, in gathering varied experience, in testing myself by the chaines of rottune, and in strays trying to profit by my reflections on what happened

. And I always had an intense desire to learn how to distinguish truth from falsehood, in order to be ele about my actions, and to walk sureroutedly in this life?

But learn what is true, in order to do what is right," is the summing up of the whole duty of man, for all who are unable to satisfy their mental hunger with the east wind of authority, and to those of us moderns who are in this position, it is one of Descartes' great claims to our reverence as

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<sup>-</sup> Discours de la Médiode vour bien conduce : su Rangon et cher la Vérité dans les Susness

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a spritual ancestor that, at three-and-twenty, he saw clearly that this was his duty, and acted up to his conviction. At two-and-thirty, in fact finding all other occupations incompatible with the search atter the knowledge which leads to action, and being possessed of a modest competence, he withdrew into Holland, where he spent nine years in learning and thinking, in such retirement that only one or two trusted friends knew of his whereabouts

In 1637 the first-finite or there long meditations were given to the world in the famous. Discourse touching the Method of using Reason rightly and of seeking Scientific Truth" which, at once an autobiography and a philosophy clothes the deepest thought in language of exquisite harmony, simplicity, and clearness

The central propositions of the whole "Discourse" are these. There is a path that leads to truth so surely that any one who will follow it must needs reach the goal whether his capacity be great or small. And there is one guiding rule by which a man may always find this path, and keep himself from straying when he has found it. This golden rule is—give unqualified assent to no propositions but those the truth of which is so clear and distinct that they cannot be doubted.

The cumulation of this great first commandment of science consecrated Doubt. It removed Doubt from the seat of penance among the grievous sins to which it had long been condemned, and enthroned it in that high place among the primary divies, which is assigned to it by the scientific consecure of these latter days. Descartes was the first among the moderns to obey this commandment deliberately, and as a matter of religious duty, to strip off all his beliefs and reduce himself to a state of intellectual makedness, until such time as he could satisfy himself which were fit to be worn. He thought a bare skin healthier than the most respectable and well-cut clothing of what might, possibly, be mere shouldy

When I say that Descrites consecrated doubt you must remember that it was that sort of doubt which Goethe has called 'the active scepticism whose whole aim is to conquer itself." and not that other sort which is born of flippincy and ignorance and whose aim is only to perpetuate itself as an excuse for idleness and indifference. But it is impossible to define what is meant by scientific doubt better than in Descrites own words. After describing the gradual progress of his negative criticism, he tells us—

"For all that, I did not import the sceptus, who doubt only for doubthar's sake and pretend to be always undecided; on the contrary, more whole intention was to arrive at a certainty, and to dig away the drift and the sand until I rewhed the rock or the clay beneath."

<sup>1 &#</sup>x27;Enn thatige Skepsis ist die welche unablassig beninkt ist sich selbst zu überwinden, und durch geregelte Eifshrung zu

And further, since no man of common sense when he pulls down his house for the purpose of rebuilding it, fails to provide lunselt with some shelter while the work is in progress, so before demolishing the spacious, if not commodious, mansion of his old beliefs, Descartes thought it wise to equip himself with what he calls "une morale par provision," by which he resolved to govern his practical life until such time as he should be better instructed The laws of this "provisional self-government' are embodied in four maxims, of which one binds our philosopher to submit himself to the laws and religion in which he was brought up, another, to act, on all those occasions which call to action, promptly and according to the best of his judgment, and to abide, without repining, by the result a third rule is to seek happiness in limiting his desires, rather than in attempting to satisfy them, while the last is to make the search after truth the business of his life

Thus prepared to go on living while he doubted Descartes proceeded to face his doubts like a man One thing was clear to him, he would not lie to himself-would, under no penalties say, "I am sure" of that of which he was not sure; but would go on digging and delving until he came to the solid adamant or, at worst, made sure there was

einen Art von bedingter Zuverlassigkeit zu gelangen '-V wesnen und Kestizionen, 7" Abtheilu (

no adamant As the record of his progress tells us, he was obliged to confess that life is full of delusions, that authority may err, that testimony may be false or mistaken, that icason lands us in endless fallacies, that memory is often as little trustworthy as hope, that the evidence of the very senses may be inisunderstood, that dreams are real as long as they last, and that what we call reality may be a long and rostless dream is conceivable that some powerful and malicious being may find his pleasure in deluding us, and m making us believe the thing which is not, every moment of our lives What, then, is certain? What even if such a being exists, is beyond the reach of his powers of delusion? Why the fact that the thought, the present consciousness, exists Our thoughts may be delusive, but they cannot be fictitions As thoughts they are real and existent. and the eleverest deceiver cannot make them otherwise

Thus thought is existence. More than that, so far as we are concerned, existence is thought, all our conceptions of existence being some kind or other of thought. Do not for a moment suppose that these are mere paradoxes or subtleties. A little reflection upon the commonest facts proves them to be irrefragable truths. For example, I take up a marble, and I find it to be a red, round hard, single body. We call the redness, the roundness, the hardness, and the singleness,

"qualities" of the marble and it sounds, at first, the height of absurdity to say that all these qualities are modes of our own consciousness, which cannot even be conceived to exist in the But consider the redness, to begin with marble How does the sensation of rodness ause? waves of a certain very attenuated matter, the particles of which are vibrating with vast rapidity, but with very different velocities strike upon the marble, and those which vibrate with one particular velocity are thrown off from its surface in all The optical apparatus of the eye gathers some of these together, and gives them such a course that they impinge upon the surface of the retine, which is a singularly delicate apparatus connected with the termination of the fibres of the optic nerve The impulses of the attenuated matter, or ether, affect this apparatus and the fibres of the optic nerve in a certain way, and the change in the fibres of the optic nerve produces yet other changes in the brain, and these, in some fashion unknown to us, give rise to the feeling, or consciousness of reduces marble could remain unchanged, and either the rate of vibration of the ether, or the nature of the retina could be altered the muble would seem noticed, but some other colour. There are many people who are what are called colour-blind, being unable to distinguish one colour from another Such an one might declare our marble to be

green; and he would be quite as right in saying that it is green, as we are in declaring it to be red. But then, as the marble cannot, in itself, be both green and red, at the same time this shows that the quality "redness' must be in our consciousness and not in the marble.

In like manner, it is easy to see that the roundness and the hardness are forms of our consciousness, belonging to the groups which we call sensations of sight and touch. If the surface of the cornea were cylindrical, we should have a very different notion of a round body from that which we possess now, and if the strength of the fabric, and the force of the muscles, of the body were increased a hundredfold, our marble would seem to be as soft as a pellet of bread crumbs

Not only is it obvious that all these qualities are in us, but, if you will make the attempt, you will find it quite impossible to conceive of 'blueness," 'roundness," and "hardness' as existing without reference to some such consciousness is our own. It may seem strange to say that even the "singleness' of the marble is relative to us, but extremely simple experiments will show that such is veritably the case, and that our two most trustworthy senses may be made to contradict one another on this very point. Hold the marble between the finger and thumb, and look at it in the ordinary way. Sight and touch agree

that it is single. Now squint, and sight tells you that there are two marbles, while touch asserts that there is only one. Next, return the eyes to then natural position, and, having crossed the touchinger and the middle finger, put the marble between their tips. Thou touch will declare that there are two marbles, while sight says that there is only one, and touch claims our behilf when we attend to it, just as imperatively as sight does.

But it may be said, the marble takes up a certain space which could not be occupied, at the s and time, by anything else. In other words, the marble has the primary quality of matter, exten-Surely this quality must be in the thing, and not in our minds? But the reply must still be; whatever may, or may not, exist in the thing, all that we can know of these qualities is a state of consciousness. What we call extension is a consciousness of a relation between two, or more, affections of the sense of sight or of touch. And it is wholly inconceivable that what we call extension should exist independently of such consciousness as our own Whether, notwithstanding this inconceivability, it does so exist, or not, is a point on which I offer no opinion Thus, whatever our marble may be in itself, all that we can know of it is under the shape of a bundle of our own consciouspesses

Nor is our knowledge of anything we know or

teel more, or less, than a knowledge of states of consciousness And our whole life is made up of Some of these states we rufer to a such states cause we call 'self, others to a cause or causes which may be comprehended under the title of "not-self, But neither of the existence of self nor of that of "not-self,' have we, or can we by any possibility have, any such unquestionable and immediate certainty as we have of the states of consciousness which we consider to be then effects. They are not numediately observed facts, but results of the application of the law of causation to those facts Strictly speak ing the existence of a "self" and of a 'not-self are hypotheses by which we account for the facts of consciousness. They stand upon the same footing as the belief in the general trustworthiness of memory and in the general constancy of the order of Nature—as hypothetical assumptions which cannot be proved, or known with that highest degree of certainty which is given by iii mediate consciousness, but which, nevertheless are of the highest practical value, intenuch as the conclusions logically drawn from them are always venified by expendice

This in my judgment, is the ultimate issue of Descartes' argument, but it is proper for me to point out that we have left Descartes himself some way behind us. He stopped at the famous formula, 'I think, therefore I am'. Yet a little

consideration will show this formula to be full of snares and verbal entanglements. In the first place, the 'therefore" has no business there. The "I am is assumed in the "I think," which is simply another way of saying 'I am thinking 'And, in the second place, I think" is not one simple proposition, but three distinct assertions folled into one. The first of these is, "something called I exists," the second is, 'something called thought exists, and the third is, 'the thought is the result of the action of the I"

Now, it will be obvious to you, that the only one of these three propositions which can stind the Cartesian test of certainty is the second. It cannot be doubted, for the very doubt is an existent thought But the first and third, whether true or not, may be doubted and have been doubted For the assertor may be asked, How do you know that thought is not self-existent, or that a given thought is not the effect of its antecedent thought, or of some external power? And a diversity of other questions, much more easily put than answered Descartes, determined as he was to strip off all the garments which the intellect weaves for itself, forgot this gossamer shirt of the "selt", to the great detriment, and indeed ruin, of his toilet when he began to clothe himself again.

But it is beside my purpose to dwell upon the minor peculiarities of the Cartesian philosophy

All I wish to put clearly before your minds thus far, is that Descartes, having commenced by declaring doubt to be a duty, found certainty in consciousness alone, and that the necessary outcome of his views is what may moperly be termed Ideal 13m. namely, the doctrine that whatever the universe may be all we can know of it is the picture presented to us by consciousness. This picture may be a true likeness—though how this can be is inconceivable, or it may have no more resemblance to its cause than one of Bach's fugues has to the person who is playing it; or than a piece of poetry has to the mouth and lips of a reciter. It is enough for all the practical purposes of human existence if we find that our trust in the representations of consciousness is verified by results, and that by their help, we are cuabled "to walk surefootedly in this life."

Thus the method, or path which leads to truth, indicated by Descartes takes us straight to the Cruical Idealism of his great successor Kant. It is that Idealism which declares the ultimate fact of all knowledge to be consciousness, or, in other words, a mental phenomenon, and therefore affirms the highest of all certainties, and indeed the only absolute certainty, to be the existence of mind. But it is also that Idealism which refuses to make any assertions, either positive or negative, as to what hes beyond consciousness. It accuses the subtle Berkeley of stepping beyond

the limits of knowledge when he declared that a substance of matter does not exist, and of illogicality, for not seeing that the arguments which he supposed depolished the existence of matter were equally destructive to the existence of soul. And it refuses to listen to the jargon of more recent days about the "Absolute" and all the other hypostatised adjectives, the initial letters of the names of which are generally printed in capital letters, just as you give a Grenadier a bearskin cap, to make him look more formidable than he is by nature

I repeat, the path indicated and followed by Descartes, which we have hitherto been treading leads through doubt to that critical Idealism which lies at the heart of modern metaphysical thought. But the "Discourse" shows us another, and apparently very different, path, which leads, quite us definitely, to that correlation of all the phanomena of the universe with matter and motion, which lies at the heart of modern physical thought, and which most people call Materialism

The early part of the seventeenth certury when Descartes reached manhood, is one of the great epochs of the intellectual life of mankind. At that time, physical science suddenly strode into the arena of public and familiar thought, and openly challenged not only Philosophy and the Church, but that common ignorance which often passes by the name of Common Scuse. The assertion of the

motion of the earth was a defiance to all three, and Physical Science threw down her glove by the hand of Gableo

It is not pleasant to think of the immediate result of the combat, to see the champion of science, old, worn, and on his knecs before the Cardinal luquisitor, signing his name to what he knew to be a lic And, no doubt, the Cardinals rubbed their hands as they thought how well they had silenced and discredited their adversary But two hundred years have passed, and however feeble or faulty her soldiers, Physical Science sits growned and enthrened as one of the legitimate rulers of the world of thought Charity children would be ashamed not to know that the earth moves, while the Schoolmen are forgotten, and the Cardinals-well, the Cardinals are at the Œeumenical Council, still at their old business of trying to stop the movement of the world

As a ship, which having lam becalmed with every stitch of canvas set, bounds away before the breeze which springs up astern, so the mind of Descartes poised in equilibrium of doubt, not only yielded to the full force of the impulse towards physical science and physical ways of thought, given by his great contemporaries Galileo and Harvey, but shot beyond them, and anticipated by bold speculation, the conclusions, which could only be placed upon a secure foundation by the labours of generations of workers.

Descartes saw that the discoveries of Galileo meant that the remotest parts of the universe were governed by mechanical laws, while those of Harrey meant that the same laws presided over the operations of that portion of the world which is nearest to us, namely our own bodily frame And crossing the interval between the centre and its vast circumference by one of the great strides of genus Descartes sought to resolve all the phænomena of the universe into matter and motion, or forces operating according to law 1 This grand conception, which is sketched in the "Discours," and more fully developed in the "Principes 'and in the Traité de l'Homme," he worked out with extraordinary power and knowledge, and with the effect of arriving 11 the lastnamed essay, at that purely mechanical view of vital phonomena towards which medern physiology is striving

Let us try to understand how Descartes got into this path and why it led him where it did. The mechanism of the circulation of the blood had evidently taken a great hold of his mind, as he describes it several times, at much length. After giving a full account of it in the "Discourse," and

At invited de toutes ses encous, if he find pass accommande and grande idea, qui consiste a avoir tend point it promine for de namene, tous les phenomenes naturels a natre qui in simple divelloppement des lors de in mecanique i is the weighty padement of Brot, ented by Bombron (Historic de la Thilosophic Cartesi and to p. 196)

emoneously ascribing the motion of the blood, not to the contraction of the walls of the heart, but to the heat which he supposes to be generated there, he adds -

"This motion, which I have just explained, is as much the necessary result of the structure of the parts which one can see in the heart, and of the nest which one may fiel there with one's ingers and of the nature of the blood, which may be expenimentally assertained; as is that of a clock of the force, the situation, and the figure of its weight, and of its wheels?

But if this apparently vital operation were expheable as a simple mechanism, might not other vital operations be reducible to the same category' Descartes replies without hesitation in the affirmatīvo

The animal specits," says be, ' less inble a very subtle fluid, or a very pure and vavid flore, and are continually generated an the heart, and ascend to the lumn as to a sort of reservoir Hence they pass into the nerves and are distributed to the muscles, causing contraction, or relation, according to their questits "

Thus, according to Descartes, the annual body is an automaton, which is competent to perferin all the animal functions in exactly the same way as a clock or any other piece of mechanism he pais the case himself -

"In proportion as these spirits [the annual spirit-] cuter the civilies of the brain, they pass thane into the poies of its substance, and from these poins into the nerves, where, according as they enter, or even only tend to enter, more or less into one than into another, they have the power of altering the figure

of the needs, into which the nerves are unserted and by this means of caning all the limbs to more. Thus as you may have seen in the grotions and the fountains in royal gridens, the force with which the water issues from its reservoir is sufficient to move various machines, and even to make them play instinments, or pronounce words according to the different disposition of the pipes which lead the water

"And, in thath, the nerves of the machine which I am describing may very well be compared to the paper of these vaterworks; its muscler and its tendons to the other various engines and springs which seem to move them, its animal sprins to the water which impers them of which the heart is the formian while the contres of the heart are the central office. Moreover, respiration in both is such actions as are natural and usual in the took and it inhalpent on the course of the sprints, are like the morements of a clock, or of a infil, which may be kept up by the ordinary flow of the ware.

'The effectual o'go is which by then mere presence, act upon the organs of the sens s, and which by this means, determine the corporal machine to move in many different ways, according as the parts of the brain me arranged, me like the strangers who, entering into some of the grottees of these waternorks, unconsciously cause the provements which take place in their presence. For they cannot enter without treading upon certain planks so arranged that its example, if they approach a bathing Diona, they cause her to hade among the reads and if they attempt to follow her, they see approaching a Neptune, who threatens them with his trident or it they try some other way, they cause some other monster, who vomits water into their faces, to dort out, or like conferences, recording to the improf the engineers who have made them. And lastly, when the rational soul is lodged in this machine, it will have its minimal seat in the fram, and will take the place of the engineer who ought to ha in that pure of the works with all the hipper are connected, when he wishes to increase or to sluken or in some way to affer their movements

<sup>1</sup> Track de l'Homme (Cousin's edition), p 317

## And again still more strongly -

All the functions which I have attailmted to this machine (the body), as the digestion of four the pulsation of the heart and of the arteries the nutrition and the growth of the limits respiration, wakefulness, and sleep the recognition of light, sounds, odours, flavours, heat, and such like quelities, in the organs of the external senses, the impression of the ideas of these in the oran of common sense and in the imagination, the retrution, of the impression, of these ideas on the memory the internal movements of the appetitus and the passions, and lastly, the external movements of all the limbs, which tollow so aptly, as well the action of the objects which are presented to the senses, as the impressions which meet in the memory that they imitate as nearly as possible those of a real man 1 I desire I say, that you should consider that these functions in the machine naturally proceed from the mere arrangement of its organe, norther more nor less than do the moven ents of a clock, or other automaton, from that of its weights and its wheels, so that, so far is these are concerned, it is not not essury to concerve any other regetative or sensitive soul, nor any other principle of motion of oil life than the blood and the spirits agitated by the fire which burns continually in the heart, and which is no wise essentially different from all the first which exist in manum ite bodies " 3

The spirit of these passages is exactly that of the most advanced physiology of the present day, all that is necessary to make them coincide with our present physiology in form, is to represent the details of the working of the animal machinery in

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I Descrites in tends that he does not apply his at we to the human body, but only to an imaginary machine which, if it could be constructed, would do all that the human body does throwing a sop to Cerberus unworthly, and usclosely, because Cerberus was by no means stupid enough to smallow it

<sup>2</sup> Trante de l'Heneme, p. 127

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modern language, and by the aid of modern conceptions

Most undoubtedly, the digestion of food in the human body is a purely chemical process, and the passage of the nutritive parts of that food into the blood, a physical operation. Beyond all question, the circulation of the blood is simply a matter of mechanism, and results from the structure and arrangement of the parts of the heart and vessels, from the contractility of those organs, and from the regulation of that contractility by an automatically acting in ryous apparatus. The progress of physiology has further shown that the contractility of the nuscles and the irritability of the nerves are purely the results of the molecular inechanism of those organs, and that the regular movements of the respiratory, alimentary, and other internal organs are governed and guided, as inechanically, by their appropriate nervous centres The even thythm of the breathing of every one of us depends upon the structural integrity of a particular region of the medulla oblongata, as much as the ticking of a clock depends upon the integrity of the escapement. You may take away the hands of a clock and break up its striking michinery, but it will still tick, and a man may be unable to feel, speak, or move, and yet he will breathe

Again, in entire accordance with Descartes' affirmation, it is certain that the modes of motion

which constitute the physical basis of light, sound, and heat, are transmuted into affections of nervous matter by the sensory organs. These affections are, so to speak, a kind of physical ideas, which are retained in the central organs, constituting what might be called physical memory, and may be combined in a manner which answers to association and imagination or may give rise to muscular contractions, in those "reflex actions" which are the mechanical representatives of volution

Consider what happens when a blow is aimed at the eye1 Instantly, and without our knowledge or will, and even against the will, the eyelids close What is it that happens? A picture of the rapidlyadvancing fist is made upon the retina at the back of the eye The retina changes this picture into an affection of a number of the fibres of the optic nerve, the tibres of the optic nerve affect certain parts of the brain, the brain, in consequence, affects those particular fibres of the seventh nerve which go to the orbicular muscle of the eyelids, the change in these nerve-fibres causes the muscular fibres to alter their dimensions, so as to become shorter and broader and the result is the closing of the slit between the two lids, round which these fibres are disposed. Here is a pure mechanism, giving rise to a purposive action, and strictly comparable to that by which Descartes

<sup>·</sup> Compare Traite dos Pas ion , Are who and wi

supposes his waterwork Diana to be inoved. But we may go further, and inquire whether our volution, in what we term voluntary action ever plays any other part, than that of Descartes' engineer, sitting in his office, and turning this tap or the other as he wishes to set one or another machine in motion, but exercising no direct influence upon the movements of the whole

Our voluntary acts consist of two paits firstly, we desire to perform a certain action, and, secondly, we somehow set a-going a machinery which does what we desire. But so little do we duectly influence that machinery, that nine-tenths of us do not even know of its existence one wills to raise one's arm and whill it round Nothing is easier But the majority of us do not know that nerves and muscles are concorned in this process, and the best anatomist among us would be amazingly perplexed, if he were called upon to direct the succession, and the relative strength, of the multitudinous nerve-changes, which are the actual causes of this very simple operation. So again in speaking How many of us know that the voice is produced in the Laynx. and modified by the mouth / How many among these instructed persons understand how the voice is produced and modified? And what living man, if he had unlimited control over all the nerves supplying the mouth and larvix of another

person, could make him pronounce a sentence? Yet, it one has anything to say what is easier than to say it? We desire the utterance of cortam words we touch the spring of the wordmachine, and they are spoken. Just as Descartes' engineer when he wanted a particular hydraulic machine to play, had only to turn a tap, and what he wished was done. It is because the body is a machine that education is possible. Education is the formation of habits, a superinducing of an artificial organisation upon the natural organisation of the body, so that acts, which at first required a conscious effort, eventually became unconscious and mechanical If the act which primarily requires a distinct consciousness and volition of its details, always needed the same effort, education would be an impossibility

According to Descartes, then, all the functions which are common to man and animals are performed by the body as a mere mechanism, and he looks upon consciousness as the peculiar distinction of the 'chose pensante,' of the 'rational soul' which in man (and in man only in Descartes' opinion) is superadded to the body. This rational soul he conceived to be lodged in the pineal gland, as in a sort of central office, and here, by the intermediation of the animal spirits, it became awine of what was going on in the body, or influenced the operations of the body. Modern physiologists do not ascribe so exalted a function to the little

pineal gland, but, in a vague sort of way, they adopt Descartes' principle, and suppose that the soul is lodged in the cortical part of the brain—at least this is commonly regarded as the seat and instrument of consciousness.

Descartes has clearly stated what he conceived to be the difference between spuit and matter. Matter is substance which has extension, but does not think; spirit is substance which thinks, but has no extension It is very hard to form a definite notion of what this phraseclogy means, when it is taken in connection with the location of the soul in the pineal gland; and I can only represent it to myself as signifying that the soul is a mathematical point, having place but not extension. within the limits of the pincal body. Not only has it place, but it must exert force, for according to this hypothesis, it is competent, when it wills, to change the course of the anunal spurts, which consist of marter in motion. Thus the soul becomes a centre of force. But ut the same time. the distinction between spuit and matter vanishes, masmuch as matter, according to a tenable hypothesis, may be nothing but a multitude of centres The case is worse it we adopt the modern rigue notion that consciousness is seated m the grey matter of the cerebrum, generally; for,

Which however, as the remains of a Cyclopean eye possessed by some remote ancestor of the Vertebrota, has lost none of its interest [1892]

as the grey matter has extension, that which is lodged in it must also have extension. And thus we are led, in another way, to lose spirit in matter

In truth, Descartes' physiology, like the modern physiology of which it anticipates the spirit, leads strength to Myterialism, so far as that title is nightly applicable to the doctrine that we have no knowledge of any tlanking substance, apart from extended substance and that thought is as much a function of matter as motion is. Thus we arrive at the singular result that, of the two paths opened up to us in the 'Discourse upon Method.' the one leads, by way of Berkelev and Hume, to Kant and Idealism, while the other leads, by way of De La Mettrie and Priestley, to modern phystology and Materialism 1 Our stem divides into two mem branches, which grow in opposite ways, and bear flowers which look as different as they can well be But each branch is sound and healthy and has as much life and vigour as the other

If a botanist found this state of things in a new plant, I imagine that he might be inclined to think that his tree was monocrous—that the

Philosophy I had not looked when this passage was written, says, very justly, that Descartes 'a merité le titre de plae de la physique, aussi bren que celui de père de la raitaphysique moderne' (t. 1. p. 197). See also Kario Fischol's Cichichle der neuen Philosophie, lid. 1. and the very remarkable work of Lange thesholite des Materialismus.—A good translation of the latter would be a creat service to philosophy in England. [It now exists, 1892]

flowers were of different sexes, and that, so far from setting up a barrier between the two branches of the tree, the only hone of fertility lay m bringing them together. I may be taking too much of a naturalists view of the case, but I must confess that this is exactly my notion of what is to be done with metaphysics and physics Their differences are complementary not autagonistic, and thought will never be completely fruitful until the one unites with the other. Let me try I hold, with the to explain what I mean Materialist, that the buman body, like all living bodies, is a machine all the operations of which will, sooner or later, be explained on physical principles I believe that we shall, sooner or later, arrive at a mechanical equivalent of consciousness, just as we have arrived at a mechanical equivalent of heat. If a pound weight falling through a distance of a foot gives rise to a definite amount of heat, which may properly be said to be its equivalent; the same pound weight falling through a foot on a man's hand gives use to a definite amount of feeling, which might with equal propriety be said to be its equivalent in consciousness 1 And as we already know that there is a certain parity between the intensity of a pain and the strength of one's desire to get rid

<sup>&</sup>lt;sup>1</sup> For all the qualifications which need to be made here, I refer the reader to the thorough discussion of the nature of the relation between nerve cotton and consciousness in Mr. Herbert Spencer's Principles of Principles, p. 115 as seq.

of that pain, and, secondly, that there is a certain correspondence between the intensity of the heat, or mechanical violence, which gives rise to the pain, and the pain itself, the possibility of the establishment of a correlation between mechanical force and volution becomes apparent. And the same conclusion is suggested by the fact that, within certain limits the intensity of the mechanical force we exert is proportioned to the intensity of our desire to exert it

Thus I am prepared to go with the Matcrialists wherever the true pursuit of the path of Descartes may lead them, and I am glad, on all occasions, to declare my belief that their fearless development of the materialistic aspect of these matters has had an immense, and a most beneficial, influence upon physiology and psychology. Nay, more, when they go farther than I think they are entitled to do—when they introduce Calvinism into science and declare that man is nothing but a machine, I do not see any particular harm in their doctrines, so long as they admit that which is a matter of experimental fact—namely, that it is a machine capable of adjusting itself within certain limits

I protest that if some great Power would agree to make me always think what is true and do what is right, on condition of being turned into a sort of clock and wound up every morning before I got out of bed, I should instantly close

with the offer. The only freedom I care about is the freedom to do right, the freedom to do wrong I am ready to part with on the chcapest terms to any one who will take it of me But when the Materialists stray beyond the borders of their path and begin to talk about there being nothing else in the universe but Matter and Force and Necessary Laws, and all the rest of their "grenadiers, 'I decline to follow them. I go back to the point from which we started, and to the other path of Descartes I remind you that we have already seen clearly and distinctly, and in a manner which admits of no doubt that all our knowledge is a knowledge of states of consciousness "Matter" and 'Foice" are, as far as we can know, mere names for certain forms of consciousness "Necessary' means that of which we cannot comceive the contrary ' Law ' means a inle which we have always found to hold good, and which we expect always will hold good Thus it is an indisputable truth that what we call the material world is only known to us under the forms of the ideal world, and, as Descartes tells us, our knowledge of the soull is more intimate and certain than our knowledge of the body If I say that impenetrability is a property of matter, all that I can really mean is that the consciousness I call extension, and the consciousness I call resistance,

<sup>1</sup> Taken as the sum of states of consciousness of the individual [1892]

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constantly accompany one another. Why and how they are thus related is a mystery. And if I say that thought is a property of matter, all that I can mean is that actually or possibly, the consciousness of extension and that of resistance accompany all other sorts of consciousness. But, as in the former case, why they are thus associated is an insoluble mystery.

From all this it follows that what I may term legitimate materialism, that is, the extension of the conceptions and of the methods of physical science to the highest as well as the lowest phænomena of vitality, is neither more nor less than a sort of shorthand Idealism, and Descartes' two paths meet at the summit of the mountain, though they set out on opposite sides of it

The reconciliation of physics and metaphysics lies in the acknowledgment of faults upon both sides, in the confession by physics that all the phænomena of Nature are, in their ultimate analysis, known to us only as facts of consciousness, in the admission by metaphysics, that the facts of consciousness are, practically, interpretable only by the methods and the formulæ of physics—and, finally, in the observance by both metaphysical and physical thinkers of Descartes' maxim—assent to no proposition the matter of which is not so clear and distinct that it cannot be doubted

When you did me the honour to ask me to deliver this address. I confess I was perplexed what topic to select. For you are emphatically and distinctly a Christian body, while science and philosophy within the range of which he all the topics on which I could venture to speak, are neither Christian, nor Unchristian, but are Extrachristian, and have a world of their own, which to use language which will be very familian to your cars just now, is not only "unsectarian," but is altogether "secular." The arguments which I have put before you to-might, for example, are not inconsistent, so far as I know, with any form of theology.

After much consideration, I thought that I might be most useful to you, if I attempted to give you some vision of this Extrachristian world, as it appears to a person who lives a good deal in it, and if I tried to show you by what methods the dwellers therein try to distinguish truth from talsehood, in regard to some of the deepest and most difficult problems that beset humanity, "in order to be clear about their actions, and to walk surefootedly in this life," as Descartes says

It struck me that if the execution of my project came anywhere near the conception of it, you would become aware that the philosophers and the men of science are not exactly what they are sometimes represented to you to be, and that their methods and paths do not lead so

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perpendicularly downwards as you me occasionally told they do. And I must admit, also, that a particular and personal motive weighed with me, —namely, the desire to show that a certain discourse, which brought a great storm about my head some time ago, contained nothing but the ultimate development of the views of the father of modern philosophy. I do not know if I have been quite wise in allowing this last motive to weigh with me. They say that the most dangerous thing one can do in a thunderstorm is to shelter oneself under a great tree, and the history of Descartes' life shows how narrowly he escaped being riven by the lightnings, which were more destructive in his time than in ours

Descartes lived and died a good Catholic, and prided himself upon having demonstrated the existence of God and of the soul of man. As a reward for his exertions, his old friends the Jesuits put his works upon the 'Index," and called him an Atheist, while the Protestant divines of Holland declared him to be both a Jesuit and an Atheist. His books narrowly escaped being burned by the hangman, the fate of Vanim was dangled before his eyes, and the misfortunes of Galileo so alarmed him, that he well-nigh renounced the pursuits by which the world has so greatly benefited, and was driven into subterfuges and evasions which were not worthy of him

<sup>1</sup> See above The Physical Burns of Lyc

"Very cowardly," you may say, and so it was But you must make allowance for the fact that, in the seventeenth century, not only did heresy mean possible burning, or imprisonment, but the very suspicion of it destroyed a man's peace, and rendered the calm pursuit of truth difficult or impossible. I fancy that Descartes was a man to care more about being wormed and disturbed, than about being burned outright, and, like many other men, sacrificed for the sake of peace and quietness, what he would have stubbornly maintained against downright violence. However this may be, let those who are sure they would have done better throw stones at him. I have no feelings but those of gratitude and reverence for the man who did what he did, when he did, and a sort of shame that any one should repine against taking a fair share of such treatment as the world thought good chough for him

Finally, it occurs to me that, such being my feeling about the matter, it may be useful to all of us if I ask you, "What is yours? Do you think that the Christianity of the seventeenth century looks nobler and more attractive for such treatment of such a man?" You will hardly reply that it does. But if it does not, may it not be well it all of you do what his within you power to prevent the Christianity of the ninetcenth century from repeating the scandal?

There are one or two living men, who, a couple

of centuries hence, will be remembered as Descartes is now, because they have produced great thoughts which will live and grow as long as mankind lasts

If the twenty-first century studies their history it will find that the Christianity of the middle of the nineteenth century recognised them only as objects of vihitcation. It is for you and such as you, Christian young men, to say whether this shall be as true of the Christianity of the future as it is of that of the present. I appeal to you to say "No," in your own interest, and in that of the Christianity you profess

In the interest of Science, no appeal is needful, as Darte sings of Fortune—

Quest' è cola, ch'è tanto po ta mi roc Pur da color, che le doman dur lod Dandole biasmo o torto e mala voca Ma ella si à biara e ciò non od-Con l'aftie pinno cicatre heta Volve sur speri o biata nigolo. "1

so, whatever evil voices may rage, Science, secure among the powers that are eternal, will do her work and be blessed

And this is the who's put on closs so much Even by them who ought to give help hise, there would ill repute and blame But she is blessed, and she hears not thus Sire with the other primal creatures, glud Revolves her sphero, and I lessed juys herself?

Infurno, va. 20-95 (W. M. Rossetta's Translation)

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## ON THE HYPOTHESIS THAT ANIMALS ARE AUTOMATA, AND ITS HISTORY

## [1874]

THE first half of the seventeenth century is one of the great epochs of biological science. For though suggestions and indications of the conceptions which took definite shape, at that time, are to be met with in works of earlier date they are little more than the shadows which coming truth easts forward; men's knowledge was neither extensive enough nor exact enough, to show them the solid body of fact which threw these shadows

But, in the seventeenth century, the idea that the physical processes of life are capable of being explained in the same way as other physical phenomena, and, therefore, that the high body is a mechanism, was proved to be true for certain classes of vital actions, and, having thus taken firm root in mefragable fact, this conception has not only successfully repelled every assault which has been made upon it but has steadily grewn in force and extent of application, until it is now the expressed or implied fundamental proposition of the whole doctime of scientific Physiology.

It we ask to whom mankind are indebted for this great service, the general voice will name William Harvey. For by his discovery of the circulation of the blood in the higher animals, by his explanation of the nature of the mechanism by which that circulation is effected, and by his no less remarkable though less known, investigations of the process of development, Harvey solidly laid the foundations of all those physical explanations of the functions of sustentiation and reproduction which modern physiologists have achieved

But the living body is not only sustained and reproduced it adjusts itself to external and internal changes it moves and feels. The attempt to reduce the endless complexities of animal motion and feeling to law and order is, at least, as important a part of the task of the physiologist as the elucidation of what are sometimes called the vegetative processes. Harvey did not make this attempt himself, but the influence of his work upon the man who did make it is patent and unquestionable. This man was René Descartes, who, though by many years

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Harvey's jumor, died before him, and yet in his short span of fifty-tom years, took an undisputed place, not only among the chiefs of philosophy, but amongst the greatest and most original of mathematicians, while, in my belief, he is no less certainly entitled to the rank of a great and original physiologist, masmuch as he did for the physiology of motion and sensation that which Harvey had done for the circulation of the blood, and opened up that road to the mechanical theory of these processes, which has been followed by all his successors

Descartes was no mere specifiator, as some would have us believe but a man who knew of his own knowledge what was to be known of the facts of anatomy and physiology in his day. He was an unwented dissector and observer, and it is said, that, on a visitor once asking to see his library, Descartes led him into a room set aside for dissections, and full of specimens under examination. "There," said he, "is my library."

I anticipate a smile of incredulity when I thus champion Descartes' claim to be considered a physiologist of the first rank. I expect to be told that I have read into his works what I find there, and to be asked, Why is it that we me left to discover Descartes' deserts at this time of day, more than two centuries after his death? How is it that Descartes is utterly ignored in some of

the latest works which treat expressly of the subject in which he is said to have been so great?

It is much easier to ask such questions than to answer thera, especially if one desires to be on good terms with one's contemporaries, but if I must give an answer, it is this. The growth of physical science is now so prodigiously rapid, that those who are actively engaged in keeping up with the present, have much ado to find time to look at the past and even grow into the habit of neglecting it But, natural as this result may be, it is none the The intellect loses, for there is less detrunental assuredly no more effectual method of clearing up one's own mind on any subject than by talking it over, so to speak, with men of real power and grasp, who have considered it from a totally different point of view. The parallax of time helps us to the true position of a conception, as the parallax of space helps us to that of a star. And the moral nature loses no less It is well to turn aside from the fretful stir of the present and to dwell with gratitude and respect upon the services of those "mighty men of old who have gone down to the grave with their weapons of war," but who, while they yet lived, won splendid victories over ignorance. It is well, again, to reflect that the fame of Descartes filled all Europe, and his authority overshadowed it, for a century; while now, most of those who know his name

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think of him, either as a poison who had some preposterous notions about vortices and was deservedly annuhilated by the great Sn Isaac Newton or as the apostle of an essentially vicious method of deductive speculation, and that, nevertheless, neither the chatter of shifting opinion, nor the silence of personal oblivion, has in the slightest degree affected the growth of the great ideas of which he was the instrument and the mouthprece

It is a matter of fact that the greatest physiologist of the eighteenth century. Haller, in treating of the functions of nerve, does little more than reproduce and enlarge upon the ideas of Descrites. It is a matter of fact that Divid Hartley, in his remarkable work the "Essay on Man." expressly, though still insufficiently, acknowledges the resemblance of his fundamental conceptions to those of Descrites, and I shall now endeavour to show that a series of propositions, which constitute the foundation and essence of the modern physiology of the nervous system, are fully expressed and illustrated in the works of Descrites.

I The brain is the organ of sensation, thought, and emotion; that is to say, some change in the condition of the matter of this organ is the invariable antecedent of the state of consciousness to which each of these terms is applied



In the "Principes de la Philosophie" (§ 169), Descartes says —<sup>1</sup>

"Although the soul is united to the whole body, its prine pal identions are, nevertheless, performed in the foun, it is here that it not only understands and imagines, but also be is, and this is effected by the intermed ation of the nerves, which extend in the form of delicate threads from the luan to all mute of the hold, to which they are attached in such a manner, that we can hardly touch any part of the body without with a the extremity of some nerve in motion. This motion pieces along the nerve to that put of the brun which is the common samourum, as I have sufficiently explained in my. Treatise on Inoptices, ' a d the movements which thus travel along the marks, as for as that part of the brain with which the soul is closely joined in I united couse it, by reason of their diverse characters, to have different thoughts. And it is these different thoughts of the soul, which arise immediately from the movements that are excited by the nerves in the beam, which we properly term our feelings, or the perceptions of our senses "

Elsewhere, Descarce, in arguing that the seit of the passions is not (as many suppose) the heart, but the brain, uses the following remarkable language —

'The opinion of those who think that the soul excess its passions in the least is of no wright, for it is bised upon the fact that the passions cause a change to be feit in that organ, and it is easy to see that this change is felt as if it were in the

I quote, how and always, Consul's edition of the works of Describes, as most convenient for reference. It is entitled Europe complete, if Decartes publifies, for Field Content 1924.

<sup>·</sup> Les Passions de l'Anie, Article xxxiii

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heart, only by the intermediation of a little nerve which descends from the brain to it. Just as pain is felt, as it it were in the toot, by the intermediation of the nerves of the foot; and the stars are perceived, as if they were in the heavens, by the intermediation of their light and of the optic nerves. So that it is no more necessary for the soul to exert its lunctions immeditials in the heart, to feel its passions there, than it is necessary that it should be in the bravens to see the stars there."

This definite allocation of all the phenomena of consciousness to the brain as their organ, was a step the value of which it is difficult for us to appraise, so completely has Descartes' view moorpointed uself with every-day thought and common language A lunatic is said to be 'crack-brained' or 'touched in the head, 'a confused thinker is ' muddle headed.' while a clever man is said to have "plenty of brams but it must be remembered that at the end of the last century a considerable, though much over-estimated, anatomist, Bieliut, so far from having reached the level of Descartes, could gravely argue that the apparatuses of organic life are the sale seat of the passions, which in no way affect the brain, except so far as it is the agent by which the influence of the passions is transmitted to the muscles.

Modern physiology, aided by pathology, easily demonstrates that the brain is the seat of all forms of consciousness, and fully bears out Descartes' explination of the reference of those sensations in

<sup>4</sup> Richardes physiologiques sur in Vic et la Mort - Pir Nav Bishat Art Sixiena

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the viscera which accompany intense emotion to these organs. It proves, directly, that those states of consciousness which we call sensations are the immediate consequent of a change in the brain excited by the sensory nerves, and, on the well-known effects of injuries, of stimulants, and of narcotics it bases the conclusion that thought and emotion are, in like manner, the consequents of physical interedects

II The movements of animals are due to the change of form of muscles, which shorten and become thicker, and this change of form in a muscle arises from a motion of the substance contained within the nerves which go to the muscle

In the Passions de l'Âme, Art vii, Descutes wites —

Moreover we know that all the movements of the lumb-depend on the muscles, and that these muscles are opposed to one another to such a manner that when one of them shortens, it draws along the part of the body to which it is attached and so gives use to a simultaneous elongation of the muscle which is opposed to it. Then, if it happens afterwards that the later shortens, it causes the former to clongate, and draws towards itself the part to which it is attached. Lastly, we know that all these movements of the muscles, as all the senses depend on the nerves, which are like little threads or tubes, which all come from the brain, and, like it, contain a certain very suntle in or wind, termed the animal spirits."

The property of muscle mentaoned by Descartes

now goes by the general name of contractility, but his definition of it remains unfouched. The long-continued controversy whether contractile substance, speaking generally, has an inherent power of contraction, or whether it contracts only in viitue of an influence everted by nerve, is now settled in Haller's favour; but Descartes' statement of the dependence of muscular contraction on nerve holds good tor the higher forms of muscle, under normal cucumstances, so that, although the structure of the various modifications of contractile wester has been worked out with astonishing muniteness-although the delicate physical and chemical changes which accompany muscular contraction have been determined to an extent of which Descartes could not have dreamed, and have quite upset his hypothesis that the cause of the shortening and thickening of the muscle is the flow of animal spirits into it from the nervesthe important and fundamental part of his statement remains perfectly true

The like may be affirmed of what he says about nerve. We know now that nerves are not exactly tubes, and that "animal spirits" are myths, but the exquisitely refined methods of investigation of Dubois-Reymond and of Helmhotz have no less clearly proved that the antecedent of ordinary muscular contraction is a motion of the molecules of the nerve going to the muscle; and that this motion is propagated with a measurable, and by

no means great, velocity, through the substance of the nerve towards the muscle

With the progress of re-earch, the term " animal spirits" gave way to "nervous fluid," and "nervous fluid" has now given way to "molecular motion of nerve-substance". Our conceptions of what takes place in nerve have altered in the same way as our conceptions of what takes place in a conducting wire have altered, since electricity was shown to be not a fluid but a mode of molecular motion. The change is of vast importance, but it does not affect Descartes' fundamental idea, that a change in the substance of a motor nerve propagated towards a muscle is the ordinary cause of muscular contraction.

III The sensations of unwants are due to a inotion of the substance of the merics which connect the sensory organs with the brain

In "La Dioptrique" (Discours Quatrième), Descartes explains, more fully than in the passage cited above, his hypothesis of the mode of action of sensory nerves—

It is the little threads or which the inner substants of the nerves is composed which subserve sensotion. You must conceive that these little threads, being inclosed in tukes, which me always distended ind kept open by the online of spurity which they contain Leither press upon nor interfere with one another and are extended from the brun to the extremity, or all the mem-



beis which are sensitive-in such a manner, that the lightest touch which excites the part of one of the member, to which a thread is attrehed gives use to a motion of the part of the brain whence it arises just in by pulling one of the ends of a suctched cond, the ounce end is instantaneously moved must take one not to magne that, in order to feel, the soul nreds to be hold certain images sent by the objects of sense to the blain, as our phriosophers community suppose, or, at least, we must concerve these images to be something quite different from what they suppose them to be For, as all they suppose is that these mages caght to assemble the objects which they represent, it is impossible for them to show low they can be formed by the objects received by the organs of the external senses and transmitted to the liam. And they have had no it ison for supposing the existence of these images except this; seeing that the mind is readly excited by a picture to conceive the object which is depicted, they have thought that it must be excited in the same way to concerve those objects which affect our senses by little pictures of them formed in the head, instead of which we ought to recollect that there are many things besides images which may excite the min l. as, for example, signs and words, which have not the least resemblance to the objects which they signify "1

Modern physiology amends Descartes' conception of the mode of action of sensory nerves in detail, by showing that their structure is the same as that of motor nerves, and that the changes which take place in them, when the sensory organs with which they are connected are excited, are of

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Locks (Human Und retaining, Book II, chap vit. 37) uses Descattes' the stratem for the seas purpose, and warms us that "most of the idea; of sensation we no more the likeness of something existing without us than the names that stand for them are the likeness of our idea; which jet, upon hearing, they are apt to excite in us," a declaration which paved the way for Berkeley.

just the same nature as those which occur in motor nerves, when the muscles to which they are distributed are made to contract there is a molecular change which, in the case of the sensory herve, is propagated towards the brain. But the great fact insisted upon by Descartes, that no likeness of external things is, or can be transmitted to the nund by the sensory organs, on the contrary, that, between the external cause of a sensation and the sensation, there is interposed a mode of motion of nervous matter, of which the state of consciousness is no likeness, but a more symbol, is of the profoundest importance. It is the physiological foundation of the doctrine of the relativity of knowledge, and a more or less complete idealism is a necessary consequence of it

For of two alternatives one must be true Either consciousness is the function of a something distinct from the brain which we call the soul and a sensation is the mode in which this soul is affected by the motion of a part of the brain, or there is no soul and a sensation is something generated by the mode of motion of a part of the brain. In the former case the phenomena of the senses are purely spiritual affections, in the latter, they are something manufactured by the mechanism of the body and as unlike the causes which set that mechanism in motion, as the sound of a repeater is unlike the pushing of the spring which gives rise to it



The nervous system stands between consciousness and the assumed external world, as an interpreter who can talk with his fingers stands between a hidden speaker and a man who is stone deaf—and Realism is equivalent to a belief on the part of the deaf man, that the speaker must also be talking with his fingers. "Les extrêmes se touchent;" the shibboleth of materialists that "thought is a secretion of the brain, is the Fichtean doctrine that "the phenomenal universe is the creation of the Ego" expressed in other language.

IV The motion of the matter of a sensory nerve may be transmitted through the brain to motion nerves, and thereby give rise to contraction of the muscles to which these motor nerve are distributed, and this reflection of motion from a sensory into a motor nerve may take place without volution, or crea contrary to it

In stating these important truths. Descartes defined that which we now term "reflex action" Indeed he almost uses the term itself, as he talks of the 'animal spirits' as "reflectins," from the sensory into the motor nerves. And that this use of the world 'reflected" was no mere accident, but that the importance and appropriateness of the

I Passons de l'Ame Art XXXII

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idea it suggests was fully understood by Descartes' contemporaries, is apparent from a passage in Willis's well-known essay, "De Anima Brutorum," published in 1672, in which, in giving an account of Descartes' views, he speaks of the animal spirits being diverted into motor channels, "velut undulatione reflexa"."

Nothing can be clearer in statement, or in illustration, than the view of reflex action which Descartes gives in the "Passions de l'Âme" Art xiii.

After recapitulating the manner in which sensory impressions transmitted by the sensory nerves to the brain give rise to sensation, he proceeds —

"And in addition to the different feelings excited in the soul by these different motions of the brain, the animal spirits, without the intervention of the soul, may take their course towards certain muscles, rather than towards others, and thus move the limbs, as I shall prove by an example. If some one moves his hand rapidly towards our eyes, as if he were going to strike us, although we know that he is a friend, that he does it only injest, and that he will be very careful to do us no harm nevertheless it will be hard to keep from winking. And this shows, that it is not by the agency of the soul that the eyes shut, since this action is contrary to that volution which is the

¹ 'Quameunque Bruti actionem, volut automati mechaniei motum artificialem, in eo consisteir quod se piimò sensibile alquod spiritus animales afficiens, eosque introisum convertens, eristronem excitat, à qua mox indem spiritus, velut undulatione iefievà denue introisum commoti aque pio concinno ipsius fabrica organorum, et partium ordine, in centos neivos musculosque determinati, iespectivos membrorum motus perficiunt '—Willis De Anima Brutorum p 5, ed 1763

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only, or at least the chief, function of the soul, but it is because the mechanism of our boly is so disposed, that the motion of the hind towards our eyes excites another movement in our biain, and this sends the animal spirits into those muscles which cause the cyclus to close?

Since Descartes time, experiment has eminently cultaged our knowledge of the details of reflex action. The discovery of Bell has enabled us to follow the tracks of the sensory and motor impulses, along distinct bundles of nerve fibres, and the spinal cord, apart from the brain, has been proved to be a great centre of reflex action, but the fundamental conception remains as Descartes left it, and it is one of the pillars of nerve physiology at the present day

V. The motion of any given portion of the matter of the brain excited by the motion of a sensory nerve, leaves behind a realiness to be moved in the same way, in that part Anything which resuscitutes the motion gives use to the appropriate feeling. This is the physical mechanism of memory

Descrites imagined that the pineal body (a curious appendage to the upper side of the brain, the function of which, if it have any, is wholly unknown) was the justiument through which the soul received impressions from, and communicated them to, the brain. And he thus endeavours to

1 See above p 189, not

explain what happens when one tries to recollect something —

"Thus when the soul will- to remember mything, this volution causing the [pineal] gland to incline itself in different direction, different eigens of the brain, until they reach that part in which are the traces, which the object which it desires to remember has left. These traces are produced thus these poies of the brain through which the [animal] spirits have previously been driven, by reason of the presence of the object, have thereby adjunct a tendency to be opened by the animal spirits who has turn towards them more easily than other poies, so that the animal spirits, impriging on these poies, enter them more reachly than others. By this means they exerte a particular morement in the juncal gland, which represents the object to the soul, and causes it to know what it is who had assert to recollet." I

That memory is dependent upon some condition of the brun is a fact established by many considerations—among the most important of which are the remarkable phenomena of aphasia. And that the condition of the brain on which memory depends, is largely determined by the repeated occurrence of that condition of its molecules, which gives rise to the idea of the thing remembered is no less certain. Every boy who learns his lesson by repeating it exemplifies the fact. Descrites, as we have seen, supposes that the pores of a given part of the brain are stretched by the animal spirits, on the occurrence of a sensation, and that the part of the brain thus stretched,

1 Les Presions de l'Ame, Ali



being imperfectly elastic, does not return to exactly its previous condition, but remains more distonsible than it was before. Hartley supposes that the vibrations, excited by a sensory, or other, impression, do not die away, but are represented by smaller vibrations of 'vibratiuncules,' the permanency and intensity of which are in relation with the frequency of repetition of the mimary vibrations. Haller has substantially the same idea, but contents himself with the general term "mutationes," to express the cerebral change which is the cause of a state of consciousness. These ' mutationes' peisist for a long time after the cause which gives rise to them has ceased to operate, and are arranged in the brain according to the order of coexistence and succession of their And he gives these persistent tiones" the picturesque name of restryin forum, "qua non in mente sed in ipso coipore et in medulla quidem cerebii incifabili mode inciedibiliter minutis notis et copia infinita, inscriptasunt "I do not know that any modern theory of the physical conditions of memory differs essentially from these, which are all children-mutatis mutundis-of the Cartesian doctrine Physiology is, at present, incompetent to say anything positively about the matter, or to go farther than the expression of the high probability, that every molecular change which gives use to a state of

<sup>1</sup> Hiller, Prime Linea, ed in Sensus interni, divir

consciousness, leaves a more or less persistent structural modification, through which the same molecular change may be regenerated by other agencies than the cause which first produced it

Thus far, the prepositions respecting the physiclogy of the nervouss ystem which are stated by Descartes have simply been more clearly defined, more fully illustrated, and, for the most part, demonstrated, by modern physiological research. But there remains a doctrine to which Descartes attached great weight, so that full acceptance of it became a sort of note of a thoroughgoing Cartesian, but which, nevertheless, is so opposed to ordinary prepossessions that it attained more general notoriety, and gave rise to more discussion. than almost any other Cartesian hypothesis is the doctrine that brute animals are mere machines or automata, devoid not only of reason, but of any kind of consciousness, which is stated briefly in the "Discours de la Méthode,' and more fully in the 'Réponses aux Quatrièmes Objections," and in the correspondence with Henry More 1

The process of reasoning by which Descartes arrived at this startling conclusion is well shown in the following passage of the "Réponses"—

<sup>&#</sup>x27;But as remaids the souls of be asts, although this is not the place for considering them, and though, without a general

<sup>1</sup> Reponse de M Descartes a M. Morus 1619 Envres tome x p 201 "Mais le plu- grand de tous les préjuges que nous ayons retenus de notre enfance, est celui du cione que les bêtes pensent." etc

exposition of physics, I can say no more on this subject than I have aheady said in the fifth part of my Treatise on Method yet, I will further state, here, that it appears to me to be a very remarkable encumstance that no movement can take place, either in the bodies of beasts, or even in our own, if these bodies have not in themselves all the organs and instruments by means of which the very same movements would be accomplished in a machine. So that, even in us, the spirit, or the soul, does not directly move the limbs, but only determines the course of that very subtle liquid which is called the animal spirits, which, running continually from the heart by the linain into the muscles is the cause of all the movements of our limbs and often may cause many different motions one as easily as the other

"And it does not even always exert this determination, for among the movements which take place in us, there are many which do not depend on the mind at all, such as the beating of the heart, the digestion of food, the nutrition, the respiration of those who sleep, and even in those who are awake, walking. singing, and other similar actions, when they are performed without the mind thinking about them And, when one who talls from a height throws his hands forward to save his head it is in virtue of no latiocination that he performs this action . it does not depend upon his mind, but takes place mer ly h cause his senses being affected by the present dairy r. some change arises in his brain which determines the animal similar to pass thence into the nerves, in such a manner as is required to produce this motion, in the same way as in a machine, and without the mind being able to hinder it. Now since we observe this in ourselves, why should we be so much astom-shed if the light reflected from the body of a wolf into the eye of a sheep has the same force to excite in it the motion of flight?

"After having observed this, if we wish to learn by reasoning whether certain movements of beasts are comparable to those which are effected in us by the operation of the mind, or, on the contrary to those which depend only on the animal spirits and the disposition of the organs, it is necessary to consider the difference between the two which I have explained in the fifth part of the Discourse on Method (for I do not think that my

others are discoverable), and then it will easily be seen, that all the actions of beasts are similar only to those which we perform without the help of our minds. For which reason we shall be forced to conclude, that we know of the existence in them of no other principle of motion than the disposition of their organs and the continual affluence of animal spirits produced by the heat of the heart, which attenuates and subtilises the blood, and it the same time, we shall acknowledge that we have had no reason for assuming any other principle, except that not having distinguished these two principles of motion, and sceing that the one, which depends only on the animal spirits and the organs, exists in beasts as well as in us, we have hashly concluded that the other, which depends on mind and on thought, was also possessed by them."

Descartes' line of argument is perfectly clear He starts from reflex action in man, from the unquestionable fact that, in ourselves, co-ordinate, purposive, actions may take place, without the intervention of consciousness of volution, or even contrary to the latter. As actions of a certain degree of complexity are brought about by mere mechanism, why may not actions of still greater complexity be the result of a more refined mechanism? What proof is there that brutes are other than a superior race of marionettes, which eat without pleasure, cry without pain, desire nothing, know nothing, and only simulate intelligence as a bee simulates a mathematician 2.1

The Port Royalists adopted the hypothesis that

<sup>1</sup> Malebranche states the view taken by orthodox Cuitesians in 1689 very foreibly 'Ainsi dans less chiens les chats, et les autres animum, il ny a ny intelligence, ny âme spuriuelle comme on l'entend ordinanement - Ils mangent sans plaisir, ils

brutes are machines, and are said to have carried its practical applications so far as to treat domestic animals with neglect, if not with actual cruelty. As late is the middle of the eighteenth century, the problem was discussed very fully and ably by Bouillier, in his "Essai philosophique sur l'Àme des Bêtes,' while Condillac deals with it in his "Traité des Animaux," but since then it has received little attention. Nevertheless, modern research has brought to light a great multitude of facts, which not only show that Descartes' view is defensible, but render it far more detensible than it was in his day.

It must be premised, that it is wholly impossible absolutely to prove the presence or absence of consciousness in anything but one's own brain, though, by analogy we are justified in assuming its existence in other men. Now if, by some accident, a man's spinal cord is divided, his limbs are paralysed, so far as his volition is concerned, below the point of many, and he is incapable of experiencing all those states of consciousness which, in his uninjured state, would be excited by untation of those nerves which come off below the many If the spinal cord is divided in the cuent sans douleur ils croissent sins le s'avoir ils ne desn'ent nen, ils ne connoissent ivin, ets ils gissent ivec adresse et d'une minère qui maique l'intelligence, c'est que Dieu les faisant pour les conservei, il a conforme leurs corps de telle manère, qui ils evitent organiquement, suns le servoir, tout ce qui peut les de ti ure et qui ls semblent ciandre. '(Teurllet de Concless Michita. tions Metaphysiques of Correspondence de N. Malebranche N. n. ciema Man tation 1841)

middle of the back, for example, the skin of the feet may be cut, or pinched, or burned, or wetted with vitriol without any sensation of touch, or of pain, arising in consciousness So far is the mon is concerned, therefore, the part of the central nervous system which has beyond the injury is out off from consciousness. It must indeed be admitted, that, it any one think fit to maintain that the spinal cord below the injury is conscious, but that it is cut off from any means of making its consciousness known to the other consciousness in the brain, there is no means of driving him from his position by logic. But assuredly there is no way of proving it and in the matter of consciousness if in anything, we may hold by the inte, "De non apparentibus et de non e ristratibus cadem est ratio ' However mean the brain the spinal cond is injured, consciousness iemains intact except that the untation of parts below the unity is no longer represented by sensation. On the other hand, pressure upon the anterior division of the bram, or extensive injuries to it, abolish consciousness Hence, it is a highly mobible conclusion, that consciousness in man depends upon the integrity of the anterior division of the brain, while the nuddle and hinder cryisions of the brain? and the rest of the nervous couties, have nothing to do with it. And it is further highly probable,



Not to be consounded with the interior middle and hinder arts of the himsephases of the cerelinan

that what is true for man is true for other vertebrated animals

We may assume, then that in a hing reitebrated annual, any segment of the cerebro-spinal axis (or spinal cord and brain) separated from that anterior division of the brain which is the organ of consciousness, is as completely incapable of giving rise to consciousness as we know it to be meanable of carrying out volutions Nevertheless, this separated segment of the spinal cord is not passive and mert. On the contrary, it is the seat of extremely remarkable powers. In our imaginary case of injury, the man would, as we have seen, be devoid of sensation in his legs, and would have not the least power of moving them. But if the soles of his feet were tickled, the logs would be drawn up just as vigorously as they would have been before the injury. We know exactly what happens when the soles of the feer are tuckled, a molecular change takes place in the sensory nerves of the sl.n, and is propagated along them and through the posterior roots of the april nerves which are constituted by them to the grey matter of the spinal coid. Through that grey matter the molecular motion is reflected into the anterior roots of the same nerves constituted by the filaments which supply the nauscles of the legs, and travelling along these motor filaments, reaches the muscles, which at once confract, and cause the limbs to be drawn up

In order to move the legs in this way, a definite co-ordination of muscular contractions is necessary, the muscles must contract in a certain order and with duly proportioned force, and moreover, as the feet are drawn away from the source of irritation, it may be said that the action has a final cause, or is purposive

Thus it follows, that the grey matter of the segment of the man's spinal cord, though it is devoid of consciousness nevertheless responds to a simple stimulus by giving rise to a complex set of muscular contractions, co-ordinated towards a definite end, and serving an obvious purpose

If the spinal coid of a frog is cut across, so as to provide us with a segment separated from the brain, we shall have a subject parallel to the injured man, on which experiments can be made without remoise, as we have a right to conclude that a frog's spinal coid is not likely to be conscious, when a man's is not

Now the frog behaves just as the man did. The legs are utterly paralysed, so far as voluntary movement is concerned, but they are vigorously drawn up to the body when any militant is applied to the foot. But let us study our frog a little farther. Touch the skin of the side of the body with a little accire acid which gives rise to all the signs of great pain in an uninjured frog. In this case, there can be no pain, because the application is made to a part of the skin supplied with

nerves which come off from the cord below the point of section, nevertheless the frog lifts up the limb of the same side, and applies the foot to rub off the acetic acid, and, what is still more remarkable if the limb be held so that the frog cannot use it, it will by and by, move the limb of the other side turn it across the body, and use it for the same rubbing process. It is impossible that the frog, if it were in its entirety and could reason, should perform actions more purposive than these and yet we have most complete assurance that, in this case, the frog is not acting from purpose, has no consciousness, and is a mere insensible machine.

But now suppose that, instead of making a section of the cord in the middle of the body, it had been made in such a manner as to separate the hindermost division of the brain from the rest of the organ, and suppose the foremost twothirds of the brain entirely taken away frog is then absolutely devoid of any spontaneity, it sits upright in the attitude which a frog habitually assumes, and it will not stir unless it is touched, but it differs from the frog which I have just described in this, that, if it be thrown into the water, it begins to swim, and swims just as well as the perfect frog does. But swimining requires the combination and successive co-ordination of a great number of muscular actions. And we are forced to conclude, that the impression



made upon the sensory nerves of the skin of the frog by the contact with the water into which it is thrown, causes the transmission to the central nervous apparatus of an impulse which sets going a certain machinery by which all the muscles of swimming are brought into play in due co-ordination. If the frog be stimulated by some irritating body, it jumps or walks as well as the complete frog can do. The simple sensory impression, acting through the machinery of the cord, gives rise to these complex combined movements.

It is possible to go a step farther that only the anterior division of the brain—so much of it as hes in front of the "optic lobes"is removed. If that operation is performed quickly and skilfully, the flog may be kept in a state of full bodily vigour for months, or it may be for years but it will sit unmoved. It sees nothing it hears nothing. It will starve sooner than feed itself, although food put into its mouth is swallowed. On irritation, it jumps or walks, if thrown into the water it swims. If it be put on the hand, it sits there, crouched, perfectly quiet, and would set there for ever If the band be inclined very gently and slowly, so that the frog would naturally tend to slip off, the creature's fore paws are shifted on to the edge of the hand, until he can just prevent himself from falling. If the turning of the hand be slowly continued, he

mounts up with great care and deliberation, putting first one leg forward and then another, until he balances himself with perfect precision upon the edge, and if the tuning of the hand is continued, he goes through the needful set of muscular operations, until he comes to be seated in security, upon the back of the hand The doing of all this requires a dchesey of coordination, and a precision of adjustment of the muscular apparatus of the body, which are only comparable to those of a rope-dancer. To the ordinary influences of light, the frog, deprived of its cerebral hemispheres, appears to be blind Nevertheless, if the animal be put upon a table, with a book at some little distance between it and the light, and the skin of the hinder part of its body is then irritated, it will jump forward, avoiding the book by passing to the right or left of it Therefore, although the frog appears to have no sensation of light, visible objects act through its brain upon the motor mechanism of its body 1

It is obvious, that had Descartes been acquainted with these remarkable results of modern research, they would have furnished him with far more powerful arguments than he possessed in favour of his view of the automatism of brutes. The

<sup>1</sup> See the remarkable essay of Goltz, Bedrage zur Lehre von den Functionen der Nervencentren des Frosches, published in 1869. I have repeated Goltz's experiments, and obtained the same results.

habits of a fing, leading its natural life, involve such simple adaptations to surrounding conditions. that the machinery which is competent to do so much without the intervention of consciousness, might well do all And this argument is vistly strengthened by what has been learned in recent times of the marvellously complex operations which are performed mechanically, and to all appearance without consciousness, by men, when, in consequence of injuly of disease, they are reduced to a condition more or less comparable to that of a frog, in which the anterior part of the bram has been removed. A case has recently been published by an eminent French physician, Dr Mesnet, which illustrates this condition so remarkably, that I make no apology for dwelling upon it at considerable length 1

A sergeant of the French army, F——, twenty-seven years of age, was wounded during the battle of Bazeilles, by a ball which fractured his left parietal bone. He ran his bayonet through the Prussian soldier who wounded him, but almost immediately his right arm became paralysed, after walking about two hundred yards, his right leg became similarly affected, and he lost his senses. When he recovered them, three weeks



<sup>1 &</sup>quot;De l'Automatisme de la Mémoire et du Souvemir, dans le Somnambulisme pathologique" Par le Di E Mesnet, Medecin de l'Hôpital Sunt-Antoine L'Unio i Médicale, Juillet 21 et 23 1874. My attention was first called to a summary of this remarkable case, which appeared in the Journal des Debats for the 7th of August, 1874, by my friend General Strachey, F.R.S.

afterwards, in hospital at Mayence the right half of the body was completely paralysed, and remained in this condition for a year. At present, the only trace of the paralysis which remains is a slight weakness of the right half of the body. Three or four months after the wound was inflicted, periodical disturbances of the functions of the brain made their appearance, and have continued ever since. The disturbances last from fifteen to thirty hours, the intervals at which they occur being from fifteen to thirty days.

For four years therefore, the life of this man has been divided into alternating phases—short abnormal states intervening between long normal states.

In the periods of normal life, the ex-sergeant's health is perfect; he is intelligent and kindly, and performs, satisfactorily the duties of a hospital attendant. The commencement of the abnormal state is ushered in by uneasiness and a sense of weight about the forehead, which the patient compares to the constriction of a circle of iron, and, after its termination, he complains, for some hours, of dulness and heaviness of the head. But the transition from the normal to the abnormal state takes place in a few minutes, without convulsions or cries, and without anything to indicate the change to a bystander. His movements remain free and his expression calin, except for a

contraction of the brow, an incessant movement of the eyeballs, and a chewing motion of the jaws The eyes are wide open, and their pupils dilated If the man happens to be in a place to which he is accustomed, he walks about as usual, but, if he is in a new place or if obstacles are intentionally placed in his way, he stumbles gently against them, stops, and then, feeling over the objects with his hands, passes on one side of them. He offers no resistance to any change of direction which may be impressed upon him, or to the forcible acceleration or retardation of his movements. He eats, drinks, smokes, walks about dresses and undresses himself, rises and goes to bed at the accustomed hours Nevertheless, pins may be run into his body, or strong electric shocks sent through it, without causing the least indication of pam, no odorous substance, pleasant or unpleasant, makes the least impression, he eats and drinks with avidity whatever is offered, and takes asafætida, or vinegar, or quinine, as readily as water, no noise affects him, and light influences him only under certain conditions Dr Mesnet remarks, that the sense of touch alone seems to persist, and indeed to be more acute and delicate than in the normal state and it is by means of the nerves of touch, almost exclusively, that his organism is brought into relation with the external Here a difficulty arises It is clear from the facts detailed, that the nervous apparatus by

which, in the normal state, sensations of touch are excited, is that by which external influences determine the movements of the body, in the abuninal state. But does the state of consciousness, which we term a tactile sensation, accompany the operation of this nervous apparatus in the abnormal state? or is consciousness utterly absent, the man being reduced to an insensible incchanism?

It is impossible to obtain direct evidence in favour of the one conclusion or the other, all that can be said is, that the case of the frog shows that the man may be devoid of any kind of consciousness

A further difficult problem is this. The man is insensible to sensory impressions made through the ear, the nose, the tongue, and, to a great extent, the eye, nor is he susceptible of pain from causes operating during his abnormal state. Nevertheless, it is possible so to act upon his tactile apparatus, as to give rise to those inolecular changes in his sensorium which are ordinarily the causes of associated trains of ideas. I give a striking example of this process in Dr. Mesnet's words—

<sup>&</sup>quot;Il se promunant dans le pardin sons un missit d'abres, on lui reinet à lumain sa cume qu'il avant laisse tomber quelques rainutes avant. Il la palpe, promone a plusieurs reprises la main sur la poignée coudée de sa canne—devient attentit—semble prêter l'oreille—et tout-a-coup, appelle 'Henri' Puis, 'Les voil's! Ils sont au moins une vingtame! à nous deux, nous en

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viendrons à bout!' Et alors portant la mem derrière son dos comme pour prendre une certouche il tait le mouvement de charger son arme, se conclue dans l'nerbe à plat ventre, la côte cachée par un arbie, de vs la position d'un tirailleur, et sint l'aime épauler, tons les mouvements de l'enneun qu'il c'oit von auguste distance.'

In a subsequent abnormal period, Dr Mesnet caused the patient to repeat this scene by placing him in the same conditions. Now in this case, the question arises whether the scries of actions constituting this singular pantomime was accompanied by the ordinary states of consciousness, the appropriate train of ideas, or not? Did the man dream that he was skirmishing? or was he in the condition of one of Vancauson's automata—a senseless mechanism worked by molecular changes in his nervous system? The analogy of the frog shows that the latter assumption is perfectly justifiable

The ex-sergeant has a good voice and had, at one time, been employed as a singer at a cafe. In one of his abnormal states he was observed to begin humming a time. He then went to his room, dressed himself carefully and took up some parts of a periodical novel, which lay on his bed, as it he were trying to find something. Dr. Mesnet, suspecting that he was seeking his music, made up one of these into a roll and put it into his hand. He appeared satisfied, took his cane and went down statis to the door. Here Dr. Mesnet turned him round, and he walked

quite contentedly, in the opposite direction, towards the room of the concierge. The light of the sun shining through a window now happened to fall upon him, and seemed to suggest the footlights of the stage on which he was accustomed to make his appearance. He stopped, opened his roll of imaginary music, put himself into the attitude of a singer, and sang, with perfect execution, three songs, one after the other. After which he wiped his face with his handkerchief and drank, without a grimuce, a tumbler of strong vinegar and water which was put into his hand.

An experiment which may be performed upon the frog deprived of the fore part of its brain, well known as Goltz's "Quak-versuch" affords a parallel to this performance. It the skin of a certain part of the back of such a frog is gently stroked with the tinger, it immediately croaks. It never croaks unless it is so stroked and the croak always follows the stroke, just as the sound of a repeater follows the touching of the spring. In the frog, this 'song' is innate—so to speak it primi—and depends upon a mechanism in the brain governing the vocal apparatus, which is set at work by the molecular change set up in the sensory nerves of the skin of the back by the contact of a foreign body.

In man there is also a vocal mechanism, and the cry of an infant is in the same sense innate and d priori, maximuch as it depends on an organic relation between its sensory nerves and the nervous mechanism which governs the vocal apparatus. Learning to speak, and learning to sing are processes by which the vocal mechanism is set to new tunes. A song which has been learned has its molecular equivalent, which potentially represents it in the brain, just as a musical box wound up, potentially represents an overture. Touch the stop and the overture begins; send a molecular impulse along the proper afferent nervo and the singer begins his song.

Again, the manuer in which the frog, though apparently insensible to light, is yet, under some circumstances, influenced by visual images, finds a singular parallel in the case of the ex-sergeant

Sitting at a rable, in one of his abnormal states, he took up a pen, felt for paper and ink, and began to write a letter to his general, in which he recommended himself for a medal on account of his good conduct and courage. It occurred to Dr. Mesnet to ascertain experimentally how far vision was concerned in this act of writing. He therefore interposed a screen between the man's eyes and his hands, under these circumstances he went on writing for a short time, but the words became illegible and he finally stopped, without manifesting any discontent. On the withdrawal of the screen he began to write again where he had left off. The substitution of water for ink in the inkstand had a similar result. He stopped,

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looked at his pen, wiped it on his coat, dipped it in the water, and began again with the same effect

On one occasion, he began to write upon the topmost of ten superimposed sheets of paper After he had written a line or two this sheet was anddenly drawn away. There was a slight expression of surprise, but he continued his letter on the second sheet exactly as it it had been the This operation was repeated five times, so that the fifth sheet contained nothing but the writer's signature at the bottom of the page Nevertheless, when the signature was finished, his eyes turned to the top of the blank sheet, and he went through the form of reading over what he had written, a movement of the hips accounpanying each word; moreover with his pen, he put in such corrections as were needed in that pair of the blank page which corresponded with the position of the words which required correction, in the sheers which had been taken away. If the tive sheets had been transparent, therefore, they would, when superposed, have formed a properly written and corrected letter.

Immediately after he had written his letter, F—got up, walked down to the garden, made himself a cigarette, lighted and smoked it. He was about to prepare another, but sought in vanifor his tobacco-pouch, which had been purposely taken away. The pouch was now thrust before his eyes and put under his noso, but he neither

saw nor smelt it, yet, when it was placed in his hand, he at once seized it, made a fresh cigarette. and ignited a match to light the latter The match was blown out, and another lighted match placed close before his eyes, but he made no attempt to take it, ind, if his digarette was lighted for him, he made no attempt to smoke All this time the eyes were vacant, and neather winked, nor exhibited any contraction of the pupils From these and other experiments Di Mesnet draws the conclusion that his patient sees some things and not others, that the sense of sight is accessible to all things which are brought into relation with him by the sense of touch, and, on the contrary, insensible to things which he outside this relation. He sees the match he holds and does not see any other

Just so the frog 'sees" the book which is in the way of his jump, at the same time that isolated visual impressions take no effect upon him <sup>1</sup>

Those who have had occasion to become acquainted with the phenomena of some unbulism and of mesmedism, will be struck with the close parallel which they present to the proceedings of F in his choicinal state. But the great value of Dr. Mesnet's observations has in the fact that the abnormal condition is true able to a definite injury to the brain and that the circumstances are such as to keep us clear of the cloud of voluntary and involuntary fictions in which the muth is too often smothered in such cases. In the unfortunite subjects of such abnormal conditions of the brain, the disturbance of the sensory and intellectual faculties is not unfrequently accompanied by a perturbation of the moral nature, which may manifest itself in a most istonishing love of lying for its own sake. And, in this respect also, F's case is singularly instruct-

As I have pointed out it is impossible to prove that F—— is absolutely unconscious in his abnormal state, but it is no less impossible to prove the contrary, and the case of the flog goes a long way to justify the assumption that, in the abnormal state, the man is a mere insensible machine

If such tacts as these had come under the knowledge of Descartes, would they not have formed an apt commentary upon that remarkable passage in the "Traité de l'Homme," which I have quoted elsewhere, but which is worth repetition?—

'All the functions which I have attributed to this machine (the body), as the digestion of food, the pulsation of the heart and of the arteries, the nutrition and the growth of the limbs, respiration, wakefulness, and sloop—the reception of light, sounds, odours, flavours, heat, and such like qualities, in the organs of the external senses, the impression of the ideas of these in the organ of common sensation and in the imagination.

ive, for though, in his moinful state, he is a perfectly honest man, in his abnormal condition he is an inveterate thief, stealing and hiding away whatever he can lay hands on, with much dextenty, and with an absurd indifference as to whether the property is his own or not. Hofiman's terrible conception of the "Doppelt ganger" is realised by men in this state—who live two lives in the one of which they may be guilty of the most criminal acts, while, in the other, they are commently virtuous and respectable. Neither life knows anything of the other. Dr. Mesnet states that he has watched a man in his amounal state elaborately proprie to hing humself, and has let him go on until asphyrir set in, when he cut him down. But on passing into the normal state the would-be suicide was wholly ignorunt of what had happened. The problem of responsibility is here as complicated as that of the prince bishop, who swore as a prince and not as a bishop. "But, highness, if the prince is damned, what will become of the bishop?" said the peasant.

the retention or the impression of these ideas on the memory the internal movements of the appetites und the pissions, and lastly the external movements of all the limbs, which follow so aptly, as well the action of the objects which are presented to the senses, as the impressions which meet in the memory, that they imitate as nearly as possible those of a real man. I desire, I say, that you should consider that these functions in the machine naturally proceed from the more arrangement of its organs, neither more nor less than do the movements of a clock, or other automaton, from that of its weights and its wheels, so that, so far as these are concerned, it is not necessary to conceive any other vegetative or sensitive soul, nor any other principle of motion or of life than the blood and the spirits agrated by the fire which burns continually in the heart, and which is no wise essentially different from all the fires which exist in inanimate hodies."

And would Descartes not have been justified in asking why we need deny that animals are machines, when men, in a state of unconsciousness, perform, mechanically, actions as complicated and as seemingly autional as those of any unimals?

But though I do not think that Descartes' hypothesis can be positively refuted, I am not disposed to accept it. The doctrine of continuity is too well established for it to be permissible to me to suppose that any complex natural phenomenon comes into existence suddenly, and without being preceded by simpler modifications, and very strong arguments would be needed to prove that such complex phenomena as those of consciousness, first make their appearance in man. We know, that, in the individual man, consciousness grows from a dim glimmer to its full light, whether

we consider the infant advancing in years or the adult emerging from slumber and swoon. We know, further, that the lower animals possess, though loss developed, that part of the brain which we have every reason to believe to be the organ of consciousness in man, and as, in other cases function and organ are proportional so we have a right to conclude it is with the brain, and that the brutes, though they may not possess our intensity of consciousness, and though from the absence of language, they can have no trains of thoughts, but only trains of feelings, yet have a consciousness which, more or less distinctly, foreshadows our own

I confess that, in view of the struggle for existence which goes on in the animal world, and of the frightful quantity of pain with which it must be accompanied, I should be glad if the probabilities were in favour of Descartes' hypothesis, but, on the other hand, considering the terrible practical consequences to domestic animals which might ensue from any error on our part, it is as well to err on the right side, it we err at all, and deal with them as weaker brethien, who are bound, like the lest of us, to pay their toll for hving, and suffer what is needful for the general good. As Hartley finely says, "We seem to be in the place of God to them, and we may justly follow the precedents He sets in nature in our dealings with them.

But though we may see reason to disagree with

Descartes' hypothesis that brutes are unconscious machines, it does not follow that he was wrong in regarding them as automata. They may be more or less conscious, sensitive, automata, and the view that they are such conscious machines is that which is implicitly, or explicitly adopted by most persons When we speak of the actions of the lower animals being guided by instinct and not by reason, what we really mean is that though they feel as we do, yet their actions are the results of their physical organisation. We believe, in short, that they are machines, one part of which (the nervous system) not only sets the rest in motion, and co-ordinates its movements in relation with changes in surrounding bodies, but is provided with special apparatus, the function of which is the calling into existence of those states of consciousness which are termed sensations, emotions, and ideas I believe that this generally accepted view is the best expression of the facts at present known

It is experimentally demonstrable—any one who cares to run a pin into himself may perform a sufficient demonstration of the fact—that a mode of motion of the nervous system is the immediate antecedent of a state of consciousness. All but the adherents of "Occasionalism," or of the doctaine of 'Pre-established Harmony" (if any such now exist), must admit that we have as much reason to regarding the mode of motion of the

nervous system as the cause of the state of consciousness, as we have for regarding any event us the cause of another. How the one phenomenon causes the other we know, as much or as little, as in any other case of causation, but we have as much right to believe that the sensation is an effect of the molecular change as we have to believe that motion is an effect of impact, and there is as much propriety in saying that the brain evolves sensation, as there is in saying that an iron rod, when hammered evolves heat

As I have endeavoured to show we are justified m supposing that something analogous to what happens in ourselves takes place in the brutes, and that the affections of their sensory nerves give rise to molecular changes in the biain which again give rise to, or evolve, the corresponding states of consciousness. Nor can there be any reasonable doubt that the emotions of brutes, and such ideas as they possess, are similarly dependent upon molecular brain changes. Each sensory impression leaves behind a record in the structure of the brain—an "ideagenous" molecule, so to speak, which is competent, under certain conditions, to reproduce, in a fainter condition, the state of consciousness which corresponds with that sensory impression, and it is these 'ideagenous inclecules" which are the physical basis of memory

It may be assumed then, that molecular changes in the brain are the causes of all the

states of consciousness of brutes. Is there any evidence that these states of consciousness may, conversely, cause those molecular changes which give rise to muscular motion? I see no such evidence. The frog walks, hops, swims, and goes through his gyronastic performances quite as well without consciousness, and consequently without volution, as with it, and, if a frog, in his natural state possesses anything corresponding with what we call volition, there is no reason to think that it is anything but a concomitant of the molecular changes in the brain which form part of the series involved in the production of motion.

The consciousness of brutes would appear to be related to the mechanism of their body simply as a collateral product of its working, and to be as completely without any power of modifying that working as the steam-whistle which accompanies the work of a locomotive engine is without influence upon its machinery. Their volition, if they have any, is an emotion indicative of physical changes, not a cause of such changes

This conception of the relations of states of consciousness with molecular changes in the brain—of psychoses with neuroses—does not prevent us from ascribing free will to brutes. For an agent is free when there is nothing to prevent him from doing that which he desires to do. If a greyhound chases a hare, he is a free agent, because his action is in entire accordance with his strong

desire to catch the hair, while so long is he is held back by the leash he is not free, being prevented by external force from following his inclination. And the ascription of freedom to the greyhound under the former incumstances is by no means inconsistent with the other aspect of the facts of the case—that he is a machine impelled to the chase, and caused, at the same time, to have the desire to catch the game by the impression which the rays of light proceeding from the hair make upon his eyes, and through them upon his brain

Much ingenious argument has at various times been bestowed upon the question. How is it possible to imagine that volition, which is a state of consciousness, and, as such, has not the slightest community of nature with matter in motion can act upon the moving matter of which the body is composed, as it is assumed to do in voluntary acts / But if, as is here suggested, the voluntary acts of brutes—or, in other words, the acts which they desire to perform—are as purely mechanical as the rest of their actions, and are simply accompanied by the state of consciousness called volution, the inquiry, so far as they are concerned, becomes superfluous. Their volitions do not enter into the chain of causation of their actions at all

The hypothesis that brutes are conscious automata is perfectly consistent with any view Vol. I

that may be held respecting the often discussed and curious question whether they have souls or not, and, if they have souls, whether those souls are immortal or not. It is obviously harmonious with the most literal adherence to the text of Scripture concerning 'the beast that perisheth", but it is not inconsistent with the amable conviction ascribed by Pope to his untutored savage," that when he passes to the happy hunting-grounds in the sky "his faithful dog shall bear him company" If the brutes have consciousness and no souls, then it is clear that, in them, consciousness is a direct function of material changes, while, if they possess immaterial subjects of consciousness, or souls, then, as consciousness is brought into existence only as the consequence of molecular motion of the brain. it follows that it is an indirect product of material The soul stands related to the body as the bell of a clock to the works, and consciousness answers to the sound which the bell gives out when it is struck.

Thus far I have strictly confined myself to the problem with which I proposed to deal at starting—the automatism of brutes. The question is, I believe, a perfectly open one, and I feel happy in running no risk of either Papal or Presbyterian condemnation for the views which I have ventured to put forward. And there are so very few interesting questions which one is, at present, allowed to

think out scientifically—to go as far as reason leads, and stop where evidence comes to an end—without speedily being deafened by the tattoo of the drum ecclesiastic '—that I have luxurated in my rare freedom, and would now willingly bring this disquisition to an end if I could hope that other people would go no farther. Unfortunately, past experience debars me from entertaining any such hope, even if

that drum's discordant sound Paraging round and round and round, '

were not, at present, as audible to me as it was to the mild poet who ventured to express his hatred of drums in general, in that well-known couplet

It will be said, that I mean that the conclusions deduced from the study of the brutes are applicable to man, and that the logical consequences of such application are fatalism materialism, and atheism—whereupon the drums will beat the pus decharge

One does not do battle with drummers, but I venture to offer a few remarks for the calm consideration of thoughtful persons, untranmelled by foregone conclusions, unpledged to shore-up tottering dogmas, and anxious only to know the true bearings of the case

It is quite true that, to the best of my judgment, the argumentation which applies to brutes

holds equally good of men, and, therefore, that all states of consciousness in us, as in them, are immediately caused by molecular changes of the brain substance. It seems to me that in men, as in brates, there is no proof that any state of consciousness is the cause of change in the motion of the matter of the organism. If these positions are well based, it follows that our mental conditions are simply the symbols in consciousness of the changes which takes place automatically in the organism, and that, to take an extreme illustration, the feeling we call volition is not the cause of a voluntary act but the symbol of that state of the brain which is the immediate cause of that act. We are conscious automata, endowed with free will in the only intelligible sense of that much-abused term-masmuch as in many respects we are able to do as we like-but none the less parts of the great series of causes and effects which, in unbroken continuity, composes that which is and has been, and shall be-the sum of existence

As to the logical consequences of this conviction of mine, I may be permitted to remark that logical consequences are the scarecrows of fools and the beacons of wise men. The only question which any wise man can ask himself, and which any honest man will ask himself, is whether a doctume is time of false. Consequences will take care of themselves, at most their importance can only

justify us in testing with extra care the reasoning process from which they result.

So that if the view I have taken did really and logically lead to fitalism materialism, and atheism, I should profess myself a fatalist, materialist, and atheist, and I should look upon those who, while they believed in my honesty of purpose and intellectual competency, should raise a line and cry against me as people who by their own admission preferred lying to truth, and whose opinions therefore were unworthy of the smallest attention.

But, as I have endeavoured to explain on other occasions, I really have no claim to rank myself among fatalistic, materialistic, or atheistic philosophers Not among fatalists, for I take the conception of necessity to have a logical, and not a physical foundation, not among materialists, for I am utterly incapable of conceiving the existence of matter if there is no mind in which to picture that existence, not among atheists for the problem of the ultimate cause of existence is one which seems to me to be hopelessly out of reach of my poor powers Of all the senseless babble I have ever had occasion to read, the demonstrations of these philosophers who undertake to tell us all about the nature of God would be the worst of they were not surpassed by the still greater absurdities of the philosophers who try to prove that there is no God.

And if this personal disclaimer should not be enough let me further point out that a great many persons whose acuteness and learning will not be contested, and whose Christian piety, and in some cases, strict orthodoxy, are above suspicion have held more or less definitely the view that man is a conscious automaton.

It is held, for example, in substance by the whole school of predestinarian theologians, typified by St Augustine, Calvin, and Jonathan Edwards—the great work of the latter on the will showing in this, as in other cases, that the growth of physical science has introduced no new difficulties of principle into theological problems, but has merely given visible body, as it were, to those already existed

Among philosophers, the pious Gouline's and the whole school of occasionalist Cartesians held this view the orthodox Leibnitz invented the term "automate spirituel," and applied it to man, the fervent Christian, Harrley, was one of the chief advocates and best expositors of the doctrine while another zealous apologist of Christianity in a sceptical age, and a contemporary of Harrley, Charles Bonnet, the Genevese naturalist, has embodied the doctrine in language of such precision and snaplicity, that I will quote the little-known passage of his "Essai de Psychologie" at length—

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## 'Another Hylothesis concerning the Mrchinism Of Ideas'

'Philosophers accustomed to judge of things by that which they are in themselves, and not by their relation to received ideas, would not be shocked if they must with the proposition that the soul is a mere spectator or the movements of its body that the latter performs of itself all that series of ictions which constitutes life that it moves of itself that it is the body alone which reproduces ideas, compares and arranges them which forms reasonings, imagines and executes plans of all kinds, etc. This hypothesis though perhaps of an excessive boldness neverthal as deserves some consideration

- ' It is not to be denied that Supreme Power could create an automaton which should exactly murate all the external and internal a roots of man
- I understind by external actions, all those movements which pass under one eyes. I term internal actions, all the motions which in the natural strice among the observed because they take place in the internet of the body—such as the movements of digestion, enculation, sensetich, etc. Moreover, I include in this category the movements which give rise to ideas, whatever be then nature
- 'In the automaton which we are considering everything would be precisely determined. Everything would assur according to the rules of the most admirable mechanism, one state would succeed another state one operation would lead to enother operation, according to intuitible laws, motion would become alternately cause and effect effect and cause reaction would answer to action, and reproduction to production

"Constructed with definite relations to the activity of the beings which compose the world, the automatou would receive impressions from it, and, in faithful consespondence thereto, it would execute a corresponding series of motions

"Indifferent towards any determination, it would yield

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equally to all, if the first impressions did not, to to speak, wind up the machine and decide its operations and its come.

"The sence of movements which this automaton endle scripes could distinguish it from all others formed on the same model, but which, not having been pliced in similar course stances, would not have expenses of the same introcessions of model and have expensed them in the same order.

The series of the automaton, set in motion by the objects presented to it would communicate their motion to the main, the chief motion apparatus of the machine. This would put in setten the muscles of the hands and feet, in victor of their series connection with the senses. These muscles, altimately contracted and detect, would approximate or remove the automaton from the objects in the relation which they would bear to the conservation or the destruction of the machine.

"The notions of perception and sensation which it emblects would have impressed on the main, would be preserved in it by the energy of its mechanism. They would become more vivid woulding to the actual condition of the automaton, considered in itself and relatively to the objects.

"Words being only the motions impressed on the organ of hearing and that of voice the diver rig of these movements, their combination, the order in which they would acceed one another, would represent judgments reasoning and all the operations of the mond

"A close correspondence between the organs of the senses, either by the opining into one mother of their nervous ramifications, or by interpreted springs (cresoris) would establish such a connection in their working that, on the occasion of the more ments impressed on one of these organs, other more ments would be excited, or vould become more wind in some of the other senses.

"Give the automaton a soul which contemplates its movements, which believes itself to be the author of them, which has different relations on the occasion of the different movements, and you will on this hypothesis construct a man

But would this man be free? Our the feeling of our liberty this feeling which is so clear and so distinct and so yield 24 to persuade us if it we are the nothers of our remons be concluded with this hypothesis? If it is more the difficulty which items the conception of the action of the sort on the body, on the order hand it haves notous and that which meets as in endearousing to conceive the action of the body on the soul."

But if Leibniz, Jonathan Edwards and Hartley -men who rank among the giants of the world of thought -could see no antagonism between the docture under discussion and Christian orthodoxy is it not just possible that smaller folk may be wrong in making such a coil about logical consequences" 9 And seeing how large a share of this clamour is laised by the clergy of one denomination or another, may I say, in conclusion, that it really would be well if ecclesistical persons would reflect that ordination whatever deep-seated graces it may coufer, has never been observed to be followed by any visible more isc in the learning or the logic of its subject. Making a man a Bishop, or entrusting him with the office of ministering to even the largest of Presbyterian congregations, or setting him up to lecture to a Church congress, really does not in the smallest degree augment such title to respect as ing opinions may intrinsically possess. And when such a man presumes on an authorny which was conferred upon him for other purposes to sit in judgment upon matters his incompetence to deal with which is patent, it is permissible to ignore his sacerdotal pretensions, and to tell him as one

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would tell a mere common, unconsecrated, layman that it is not necessary for any man to occupy hunself with problems of this kind unless he so choose life is filled full enough by the performance of its ordinary and obvious duries that, if a man elect to become a judge of these grave questions, still more, if he assume the responsibility of attaching maise or blame to his fellow-men for the conclusions at which they arrive touching them, he will commit a sin more grievous than most breaches of the Decalogue, unless he avoid a lazy reliance upon the information that is gathered by prejudice and filtered through passion, unless he go back to the prime somees of knowledge—the facts of Nature, and the thoughts of those wise men who for generations past have been her best interpretors

#### VI

#### ADMINISTRATIVE NIHILISM

### [1871]

To me, and, as I trust, to the great majority of those whom I address the great attempt to educate the people of England which has just been set afoot, is one of the most satisfactory and hopeful events in our modern history. But it is impossible, even if it were desirable, to shut our eyes to the fact that there is a minority, not inconsiderable in numbers, nor deticient in supporters of weight and authority, in whose judgment all this legislation is a step in the wrong direction false in principle, and consequently suit to produce evil in practice

The arguments employed by these objectors are of two kinds. The first is what I will venture to term the caste argument for, if logically carried out it would end in the separation of the people of this country into castes, as permanent and as

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sharply defined if not as numerous, as those of India. It is maintained that the whole fabric of society will be destroyed if the poor, as well as the righ, are educated, that anything like sound and good education will only make them discontented with their station and raise hopes which, in the great majority of cases, will be bitterly disappointed. It is said. There must be hewers of wood and drawers of water, scavengers and coalheavers, day labourers and domestic servants, or the work of society will come to a stand-still. But, if you educate and refine everybody, nobody will be content to assume these functions, and all the world will want to be gentlemen and ladies.

One hears this argument most frequently from the representatives of the well-to-do untille class; and, coming from them, it strikes me as peculiarly inconsistent, as the one thing they admire, strive after, and advise them own children to do, is to get on in the world and if possible, rise out of the class in which they were born into that above them. Society needs grocers and merchants as much as it needs coalheavers, but if a merchant accumulates wealth and works his way to a baronetcy, or if the son of a greengrocer becomes a lord chancellor, or an archbishop, or, as a successful soldier, wins a peerage, all the world admires them, and looks with pride upon the social system which renders such achievements possible.

Nobody suggests that there is anything wrong in their being discontented with their station, or that, in their cases society suffers by men of ability reaching the positions for which Nature has fitted them.

But there are better replies than those of the tu quoque sort to the caste agument. In the first place it is not true that education as such unfits men for rough and laborious or even disquisting, The life of a sollor is rougher and occupations harder than that of nine landsmen out of ten and yet, as every ship's captain knows, no sailor was ever the worse for possessing a trained intelligence The life of a medical practitioner, especially in the country is harder and more laborious than that of most artisans, and he is constantly obliged to do things, which, in point of pleasantness, cannot be tanked above scavengering-yet he always ought to be, and he frequently is, a highly educated man In the second place, though it may be granted that the words of the catechism, which require a man to do his duty in the station to which it has pleased God to call him, give an admirable definition of our obligation to ourselves and to society, yet the question remains, how is any given person to find out what is the particular station to which it has pleased God to call lum? A new-born infant does not come into the world labelled scavenger, shopkeeper, bishop or duke One mass of red pulp is just like another to all

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outward appearance. And it is only by finding out what his faculties are good for, and seeking, not for the sake of gratifying a paltry vanity, but as the highest duty to himself and to his fellow-men, to put hunself into the position in which they can attain their full development, that the man discovers his true station That which is to be lamented, I fancy, is not that society should do its utmost to help capacity to ascend from the lower strata to the higher, but that it has no machinery by which to facilitate the descent of incapacity from the higher strata to the lower. In that noble romance, the "Republic" (which is now, thanks to the Master of Balliol, as intelligible to us all as it it had been written in our mother tongue), Plato makes Sociates say that he should like to inculcate upon the citizens of his ideal state just one "royal ho"

" 'Citizens' we shall say to them in our tale- You no mothers, yet God his framed you differently Same of you have the power of command, and these He has composed of gold, wherefore also they have the greatest honors, others of silver, to be auxiliaries others again, who are to be bushandmen and craftsmen. He has made of brass and non, and the species will generally be preserved in the children. But as you are of the same original family, a golden parent will sometime have a silver son, or a silver parent a golden son. And God paor laines to the ruless, as a first principle, that before all they should with orm then offspring, and see what eliments mingle with then nature, for if the son of a golden or silver parent has an admixture of base and from then nature orders a transposition of rule, and the eye of the ruler must not be putitud towards his shild because he has to descend in the scale and become a

husbandman or arusan; just as there may be others sprung from the artisan class, who are raised to honour, and become gazehan and auxiliaties. For an era to says that when a rien of brass and non-gaze's the State, in will then be destroyed. "1

Time, whose tooth gnaws away everything else is powerless against truth, and the lapse of more than two thousand years has not weakened the torce of these wise words. Not is it necessary that, as Plato suggests, society should provide functionaires expressly charged with the performance of the difficult duty of picking out the men of brass from those of silver and gold Educate, and the latter will certainly rise to the top remove all those artificial props by which the brass and non tolk are kept at the top, and, by a law as sure as that of gravitation, they will gradually sink to the bottom. We have all known noble lords who would have been coachmen, or gamekeepers, or billiard-markers, if they had not been kept affoat by our social corks, we have all known men unoug the lowest ranks, of whom every one has said. "What might not that man have become if he had only had a little education?"

And who that attends, even in the most superficial way, to the conditions upon which the stability of modern society—and especially of a society like ours in which recent legislation has placed sovereign authority in the hands of the

<sup>1</sup> The Divilogue of Plato Prinslated into English, with Analysis and Introduction by B Jowett, MA Vol 11 p 243

masses whenever they are united enough to wield their power—can doubt that every man of high natural ability, who is both ignorant and miseiable, is as great a danger to society as a rocket without a stick is to the people who fire it? Miscry is a match that never goes out, gonns, as an explosive power, beats gunpowder hollow, and if knowledge which should give that power guidance is wanting, the chances are not small that the rocket will simply run a-muck among friends and foes. What gives force to the socialistic movement which is now stirring European society to its depths, but a determination on the part of the naturally able men among the proletariat to put an end, somehow or other, to the misery and degradation in which a large proportion of their fellows are steeped! The question, whether the means by which they purpose to achieve this end are adequate or not is at this moment the most important of all political questions-and it is beside my present purpose to discuss it All I desno to point out is, that if the chance of the controversy being decided calmly and rationally. and not by passion and force, looks miserably small to an impartial bystander, the reason is that not one in ten thousand of those who constitute the ultimate court of appeal, by which questions of the utmost difficulty, as well as of the most momentous gravity, will have to be decided, is prepared by education to comprehend the



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real nature of the suit brought before their tribunal

Finally, as to the ladies and gentlemen question. all I can say is, would that every woman-child born into this world were trained to be a lady, and every man-child a gentleman' But then I do not use those much-abused words by way of distinguishing people who wear fine clothes, and live in fine houses, and talk aristociatic slang from those who go about in fustian, and live in back slums, and talk gutter slang Some inboin plebeian blindness, in fact, prevents ine from understanding what advantage the former have over the latter. I have never even been able to understand why pigeon-shooting at Hurlingham should be refined and polite, while a rat-killing match in Whitechapel is low, or why "What a lark 'should be coarse, when one hears "How awfully jolly 'diop from the most refined lips twenty times in an evening.

Thoughtfulness for others generosity, modesty, and self-respect, are the qualities which make a real gentleman, or lady, as distinguished from the veneered article which commonly goes by that name. I by no means wish to express any sentimental preference for Lazarus against Dives, but, on the face of the matter, one does not see why the practice of these virtues should be more difficult in one state of life than unother, and any one who has had a wide experience among all

sorts and conditions of men, will, I think, agree with me that they are as common in the lower ranks of life as in the higher

Leaving the caste argument aside theu, as inconsistent with the practice of those who employ it, as devoid of any justification in theory, and as utterly muschievous if its logical consequences were carried out, let us turn to the other class of objectors To these opponents, the Education Act is only one of a number of pieces of legislation to which they object on principle, and they include under like condemnation the Vaccination Act, the Contagious Diseases Act, and all other sanitary Acts, all attempts on the part of the State to prevent adulteration, or to regulate injurious trades, all legislative interference with anything that bears directly or inductly on commerce, such as slupping, harbours, railways roads, cab-fares and the carriage of letters, and all attempts to promote the spread of knowledge by the establishment of teaching bodies, examining bodies, libraries, or museums, or by the sending out of scientific expeditions, all endeavours to advance art by the establishment of schools of design, or picture galleries, or by spending money upon an architectural public building when a blick box would answer the purpose According to their views, not a shilling of public money must be bestowed upon a public park or pleasureground, not sixpence upon the relict of starvation,

or the cure of disease. Those who hold these views support them by two lines of argument They enforce them deductively by arguing from an assumed axiom that the State has no right to do anything but protect its subjects from aggres-The State is simply a policeman, and its duty is neither more nor less than to prevent robbery and murder and enforce contracts. It is not to promote good, not even to do anything to prevent evil, except by the enforcement of penalties upon those who have been guilty of obvious and tangible assaults upon purses or persons. And, according to this view, the proper torm of government is neither a monarchy, an anstociacy, nor a democracy, but an astynomog acy or police government. On the other hand, these views are supported à posteriori, by an induction from observation, which professes to show that whatever is done by a Government beyond these negative limits, is not only sure to be done badly, but to be done much worse than private enterprise would have done the same thing

I am by no means clear as to the truth of the latter proposition. It is generally supported by statements which prove clearly enough that the State does a great many things very badly. But this is really beside the question. The State lives in a glass house, we see what it tries to do, and all its failures, partial or total, are made the most of. But private enterprise is sheltered under

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good opaque bricks and mortar. The public rarely knows what it tires to do, and only hears of failures when they are gross and patent to all the Who is to say how private enterprise would come out if it tried its hand at Stite work? Those who have had most experience of jointstock companies and their management will probably be least inclined to believe in the innate superiority of private enterprise over State If continental bureaucracy and man igement centralisation be traught with multitudinous evils, surely English beadleocracy and parochial obstruction are not altogether levely. If it be said that as a matter of political experience at is tound to be for the best interests, including the healthy and free development, of a people, that the State should restrict itself to what is absolutely necessary and should leave to the voluntary efforts of individuals as much as voluntary effort can be got to do, nothing can be more just But, on the other hand, it seems to me that nothing can be less justifiable than the dogmatic assertion that State interference, beyond the limits of home and foreign police, must, under all cucumstances, do haim

Suppose, however, for the sake of argument, that we accept the proposition that the functions of the State may be properly summed up in the one great negative commandment,—"Thou shalt not allow any man to interfere with the liberty of

any other man,"-I am unable to see that the logical consequence is any such restriction of the power of Government, as its supporters apply If my next-door neighbour chooses to have his chains in such a state as to create a poisonous atmosphere which I breathe at the risk of typhord and diphtheria, he restricts my just freedom to live just as much as if he went about with a pistol, threatening my life, if he is to be allowed to let his children go unvaccinated, he might as well be allowed to leave strychume lozenges about in the way of mme, and if he brings them up untaught and untramed to earn then living, he is doing his best to restrict my freedom, by increasing the builden of taxation for the support of goods and workhouses, which I have to pay

The higher the state of civilisation, the more completely do the actions of one member of the social body influence all the rest, and the less possible is it for any one man to do a wrong thing without intertering, more or less, with the freedom of all his fellow-citizens. So that, even upon the narrowest view of the functions of the State, it must be admitted to have wider powers than the advocates of the police theory are disposed to admit.

It is urged, I am aware, that if the right of the State to step beyond the assigned limits is admitted at all, there is no stopping, and that the principle which justifies the State in enforcing vaccination of education, will also justify it in prescribing my religious belief, or my mode of carrying on my trade of profession, in determining the number of courses I have for dinner or the pattern of my waistcoat

But surely the answer is obvious that, on similar grounds, the right of a man to eat when he is hungry might be disputed, because if you once allow that he may eat at all, there is no stopping him until he goiges himself, and suffers all the ills of a surfeit In practice, the man leaves off when reason tells him he has had enough, and, in a properly organised State, the Government, being nothing but the corporate reason of the community, will soon find out when State interference has been carried far enough. And, so far as my acquaintance with those who carry on the business of Government goes, I must say that I find them far less eager to interfere with the people, than the people are to be interfered with. And the reason is obvious. The people are keenly sensible of particular evils, and, like a man suffering from pain, desire an immediate remedy. The statesman, on the other hand, is like the physician, who knows that he can stop the pain at once by an opiate, but who also knows that the opiate may do more harm than good in the long run. In three cases out of four the wisest thrug he can do is to wait, and leave the case to nature. But in the fourth case, in which the symptoms are

unmistakable, and the cause of the disease distinctly known, prompt remedy saves a life. Is the fact that a wise physician will give as little medicine as possible any argument for his abstauring from giving any at all?

But the argument may be met directly. It may be granted that the State, or corporate authority of the people, might with perfect propriety order my religion, or my waistcoat, if as good grounds could be assigned for such an order as for the command to educate my children. And this leads us to the question which lies at the root of the whole discussion—the question, namely, upon what foundation does the authority of the State rest, and how are the limits of that authority to be determined?

One of the oldest and profoundest of English philosophers, Hobbes of Malmesbury writes thus —

"The office of the soveteign, be it monarch or an assembly, consisteth in the circle for which he was entrusted with the sovereign power, namely, the procuration of the safety of the people to which he is obliged by the law of nature, and to render an account thereof to God, the author of that law, and to none but Him. But by safety, here, is not meant a bare preservation, but also all other contentments of life, which every man by lawful industry, without danger or hurt to the commonwealth, shall acquire to himself."

At first sight this may appear to be a statement of the police-theory of government, pure and simple, but it is not so. For Hobbes goes on to say —

"And this is intended should be done, not by care applied to individuals, further than their protection from injuries, when they shall complain, but by a general providence contained in public instruction both of doctrine and example, and in the making and executing of good laws to which individual persons may apply their own cases." <sup>1</sup>

To a witness of the civil war between Charles I and the Parliament it is not wonderful that the dissolution of the bonds of society which is involved in such strife should appear to be "the greatest evil that can happen in this life," and all who have read the "Leviathan" know to what length Hobbes's anxiety for the preservation of the authority of the representative of the sovereign power, whatever its shape, leads him. But the justice of his conception of the duties of the sovereign power does not seem to me to be invalidated by his monstrous doctrines respecting the sacredness of that power

To Hobbes, who lived during the break-up of the sovereign power by popular force, society appeared to be threatened by everything which weakened that power; but, to John Locke, who witnessed the evils which flow from the attempt of the sovereign power to destroy the rights of the people by fraud and violence, the danger lay in the other direction

The safety of the representative of the sovereign power itself is to Locke a matter of very small

<sup>&</sup>lt;sup>1</sup> Levuthan, Molesworth's ed p 322

proment, and he contemplates its abolition when it ceases to do its duty, and its replacement by another as a matter of course. The great champion of the revolution of 1688 could do no less. Nor is it otherwise than natural that he should seek to limit, rather than to enlarge, the powers of the State, though in substance he entirely agrees with Hobbes's view of its duties—

"But though men," says he, "when they enter into society. give up the equality, liberty and elecutive power they had in the state of nature into the hands of the society, to be so far disposed of by the Legislature as the good of sourty shall require yet it being only with an intention in every one the better to preserve hims-if his liberty and property (for no rational creature can be supposed to change his condition with an intention to be worse), the power of the society, or legislatio i constituted by them can never be supposed to extend further than the common good but is obliged to secure every one's property by providing against those three defects above mentioned, that made the state of nature so unsate and uneasy And so, whoever has the legislative or supreme power of any commonwealth, is bound to govern by established standing laws, promulgated and known to the people, and not by extemporary decrees, by indifferent and upright judges, who are to decide controversies by those laws and to employ the force of the community at home only in the execution of such laws, or abload, to prevent or redress foreign injuries, and secure the community from in roads and invasion. And all this to be directed to no other end than the peace, safety, and public good of the people ' 1

Just as in the case of Hobbes, so in that of Locke, it may at first sight appear from this passage that the latter philosopher's views of the

<sup>1</sup> Locke's Essay, Of Civil Government, § 131

functions of Government incline to the negative rather than the positive, side But a further study of Locke's writings will at once remove this misconception. In the famous 'Letter concerning Toleration,' Locke says —

"The commonwealth seems to me to be a society of men constituted only for the procuring, preserving, and advancing their own civil interests

Civil interests I call life liberty, health, and indolency of body and the possession of outward things, such as money lands, houses furniture, and the like

"It is the duty of the civil magistrate, by the impartial execution of equal laws, to score unto all the people in general, and to every one of his subjects in particular, the just possession of those things belonging to this life

". The whole jurisdiction of the magistrate maches only to these civil concernments. All civil power, right, and dominion, is bounded and confined to the only care of promoting these things."

Elsewhere in the same 'Letter," Locke lays down the proposition that if the inagistrate understand washing a child "to be profitable to the curing or preventing any disease that children are subject unto, and esteem the matter weighty enough to be taken care of by a law, in that case he may order it to be done"

Locke seems to differ most widely from Hobbes by his strong advocacy of a certain measure of toleration in religious matters. But the reason why the civil magistrate ought to leave religion alone is, according to Locke, simply this, that "true and saving religion consists in the inward persuasion of the mind. And since such is the nature of the understanding that it cannot be compelled to the belief of anything by outward force, it is absurd to attempt to make menicligious by compulsion. I cannot discover that

Locke fathers the pet doctrine of modern Liberalism, that the toleration of error is a good thing

m itself, and to be reckoned among the cardinal virtues, on the contrary, in this very "Letter on Toleration" he states in the clearest language that 'No opinion contrary to human society, or to those moral rules which are necessary to the preservation of civil society, are to be tolerated by the magistrate". And the practical corollary which he draws from this proposition is that

there ought to be no toleration for either Papists or Athersts

After Locke's time the negative view of the functions of Government gradually grew in strength, until it obtained systematic and able expression in Wilhelm von Humboldt's 'Ideen," the essence of which is the denial that the State

has a right to be anything more than chief policeman. And, of late years, the belief in the efficacy of doing nothing, thus formulated, has acquired considerable popularity for several reasons. In the first place, men's speculative convictions have become less and less real, their tolerance is large

An English translation has been published under the title of Essay on the Sphere and Duties of Government

because their belief is small, they know that the State had better leave things alone inless it has a clear knowledge about them, and, with reason, they suspect that the knowledge of the governing power may stand no higher than the very low watermark of their own

In the second place, men have become largely absorbed in the more accumulation of wealth, and as this is a matter in which the plainest and strongest form of self-interest is intensely concerned, science (in the shape of Political Economy, has readily demonstrated that self-interest may be safely left to find the best way of attaining its Rapidity and certainty of intercourse between different countries the enormous development of the powers of machinery, and general peace (however interrupted by brief periods of warfare), have changed the face of commerce as completely as modern artillery has changed that of The merchant found himself as much buildened by ancient protective measures as the soldier by his armour—and negative legislation has been of as much use to the one as the stripping off of breast-plates, greaves and buff-coat to But because the soldier is better the other without his armour it does not exactly follow that it is desirable that our detenders should strip themselves stark naked, and it is not more apparent why lanssez-farre-great and beneficial as it may be in all that relates to the accumulation of wealthshould be the one great commandment which the State is to obey in all other matters, and especially in those in which the justification of hassisfanc, namely, the keen insight given by the strong stimulus of direct personal interest, in matters clearly understood, is entirely absent

Thirdly, to the indifference generated by the absence of fixed beliefs, and to the confidence in the efficacy of lasset-fane, apparently justified by experience of the value of that principle when applied to the pursuit of wealth, there must be added that nobler and better reason to a prefound distruct of legislative interference which animates. Von Humboldt and sames forth in the pages of Mr Mill's famous Essay on Liberty—I mean the just fear lest the end should be sacrificed to the means, lest freedom and variety should be drilled and disciplined out of human life in order that the great mill of the State should grind smoothly

One of the profoundest of hving English philosophers, who is at the same time the most thoroughgoing and consistent of the champions of astynomociacy, has devoted a very able and ingenious essay<sup>1</sup> to the drawing out of a comparison between the process by which men have advanced from the savage state to the highest civilisation, and that by which an animal passes from the condition of an almost shapeless and

<sup>1</sup> The Social Organism Essays Second Series

structureless germ, to that in which it exhibits a highly complicated structure and a corresponding diversity of powers. Mr Spencer says with great justice—

'That they gradually measast in mass, that they become, little by intile, more complex, that, at the same time their parts grow more mutually dependent, and that they continue to line and grow as wholes, white speciesive generations of their mais appear and disappear—are broad positioners which bodies pointed display, in common with all living halos, and in which they and living bodies differ from everything else."

In a very striking passage of this essay Mi. Spencer shows with what singular closeness a parallel between the development of a nervous system, which is the governing power of the body in the series of animal organisms, and that of government, in the series of social organisms, can be drawn—

Stronge as the assistant will be thought, says by Speners, our Houses of Parliament reschange in the rocal economy tructions that are, in sundry respects, comparable to those discharged by the cerebral masses in a vertebrate annual. The crebrary co-ordinates the countless betterogeneous considerations which affect the present and fature welfare of the individual as a whole and the Legislature co-ordinates the countless betterogeneous considerations which affect the immediate and ionote welfare of the whole community. We may describe the office of the brain as that of arcropary the interests of life, physical, intellectual, moral, social, and a good brain is one in which the desires answering to their respective interests are so talcared, that the conduct they jointly distate sacribers none of them. Similarly we may describe the office of Parliament is that of crecioning the interests of the various classes in a com-

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munity, and a good Parliament is one in which the parties arewering to these respective interests are so balanced, that the numbed legislation concedes to each class as much as consists with the claims of the rest."

All this appears to be very just. But if the resemblances between the body physiological and the body politic are any indication, not only of what the latter is and how it has become what it is, but of what it ought to be, and what it is tending to become I cannot but think that the real force of the analogy is totally opposed to the negative new of State function.

Suppose that, in accordance with this view, each muscle were to maintain that the nervous system had no right to interfere with its contraction, except to prevent it from hindering the contraction of another muscle, or each gland, that it had a right to secrete, so long as its secretion interfered with no other, suppose every separate cell left free to follow its own 'interest," and lanser-journ lord of all what would become of the body physiological?

The fact is that the sourcing power of the body thinks for the physiological organism, acts for it, and rules the individual components with a rod of from. Even the blood-corpusches can't hold a public meeting without being accused of "congestion"—and the brain, like other despots whom we have known, calls out at once for the use of sharp steel against them. As in Hobbes's

' Leviathan," the representative of the sovereign authority in the living organism, though he derives all his powers from the mass which he rules, is above the law. The questioning of his authority involves death, or that partial death which we call pullysis Hence, if the analogy of the body politic with the body physiological counts for anything, it seems to me to be in tayour of a much larger amount of governmental interference than exists at present, or than I. for one, at all desire to see But, tempting as the opportunity is, I am not disposed to build up any argument in favour of my own case upon this analogy, curious, interesting, and in many respects close, as it is, for it takes no cognisance of certain profound and essential differences between the physiological and the political podies

Much as the notion of a 'social contract" has been indiculed, it nevertheless seems to be clear enough, that all social organisation whatever depends upon what is substantially a contract, whether expressed or implied, between the members of the society. No society ever was, or ever can be, really held together by force. It may seem a paradox to say that a slaveholder does not make his slaves work by force, but by agreement. And yet it is true. There is a contract between the two which, if it were written out, would run in these terms —"I undertake to feed, clothe, house,

and not to kill, flog, or otherwise maltreat you, Quashie, if you perform a certain amount of work." Quashie, seeing no better terms to be had, accepts the bargain, and goes to work accordingly. A highwayman who garrotes me, and then clears out my pockets, robs me by force in the strict sense of the words, but if he puts a pistol to my head and demands my money or my lite, and I, preferring the latter, hand over my puise we have virtually made a contract and I perform one of the terms of that contract. If nevertheless, the highwayman subsequently shoots me, everybody will see that in addition to the crimes of murder and theft, he has been guilty of a breach of contract.

A despote Government, therefore, though often a mere combination of slaveholding and highway robbery, nevertheless implies a contract between governor and governed, with voluntary submission on the part of the latter, and à fortion, all other forms of government are in like case

Now a contract between any two men implies a restriction of the freedom of each in certain particulars. The highwayman gives up his freedom to shoot me, on condition of my giving up my freedom to do as I like with my money. I give up my freedom to kill Quashie on condition of Quashie's giving up his freedom to be idle. And the essence and toundation of every social organisation, whether simple or complex, is the

fact that each member of the society voluntarily renounces his freedom in certain directions, in return for the advantages which he expects from association with the other members of that society. Nor are constitutions, laws, or manners, in ultimate analysis, anything but so many expressed or implied contracts between the members of a society to do this, or abstain from that

It appears to me that this feature constitutes the difference between the social and the physiological organism. Among the higher physiological organisms, there is none which is developed by the conjunction of a number of primitively independent existences into a complex whole process of social organisation appears to be comparable, not so much to the process of organic development, as to the synthesis of the chemist, by which independent elements are gradually built up into complex aggregations-in which each element retains an independent individuality, though held in subordination to the whole atoms of carbon and hydrogen, oxygen, nitrogen, which enter into a complex molecule, do not lose the powers originally inherent in them, when they unite to form that inolecule, the properties of which express those forces of the whole aggregation which are not neutralised and balanced by one Each atom has given up something, another in order that the atomic society, or molecule, may subject. And as soon as any one or more of the



atoms thus associated resumes the freedom which it has renounced, and follows some external attraction, the molecule is broken up and all the peculiar properties which depended upon its constitution vanish

Every society, great or small, resembles such a complex molecule, in which the atoms are represented by men, possessed of all those multifarious attractions and repulsions which are manifested in their desires and volutions, the unlimited power of satisfying which, we call freedom social inolecule exists in virtue of the renunciation of more or less of this freedom by every individual It is decomposed, when the attraction of desire leads to the resumption of that freedom. the suppression of which is essential to the existence of the social molecule And the great problem of that social chemistry we call politics is to discover what desires of mankind may be gratified, and what must be suppressed, if the highly complex compound, society, is to avoid decomposition That the gratification of some of men's desnes shall be renounced is essential to order, that the satisfaction of others shall be permitted is no less essential to progress, and the business of the sovereign authority—which is, or ought to be, simply a delegation of the people appointed to act for its good-appears to me to be, not only to enforce the renunciation of the anti-social desires, but wherever it may be

necessary, to promote the satisfaction of those which are conducive to progress

The great metaphysician, Immanuel Kant, who is at his greatest when he discusses questions which are not metaphysical, wrote, nearly a century ago, a wonderfully instructive essay entitled "A Conception of Universal History in relation to Universal Citizenship," I from which I will borrow a few pregnant sentences —

"The means of which Nature has availed herself, in order to bring about the development of all the capacities of man, is the autagonism of those capacities to social organisation, so far as the latter does in the long run necessitate their definite correla-By antagonism, I here mean the unsocial secribility of mankind—that is, the combination in them of an impulse to enter into society, with a thorough spirit of opposition which constantly threatens to break up this society The ground of this lies in human nature. Man has an inclination to onter into society, because in that state he tools that he becomes more i man, or, in other words that his natural faculties develop But he has also a great tendency to isolate himself, because he is, at the same time, aware of the unsocial poruliarity of desiring to have everything his own way, and thus, being conscious of an inclination to oppose others, he is naturally hid to expect opposition from them

"Now it is this opposition which twikens all the dormant powers of men, stimulates them to overcome their inclination to be idle, and, spurred by the love of honour, or power, or wealth, to make themselves a place among their tellows, whom they can neither do with, nor do without

<sup>1</sup> Idea zu einer allgemeinen Geschichte in weltburgerlicher Absicht, 1754 This paper has been translated by De Quincey and attention has been recently drawn to its "signal ments" by the Editor of the Fortnightly Review in his Essay on Condocet (Fortnightly Remew, No. axavin N.S. pp. 156, 137)

Thus they make the first steps from brutishness towards culture, of which the social value of man is the measure. Thus all talents become gradually developed, taste is formed, and by continual enlightenment the foundations of a way of thinking me laid, which gradually changes the mere rude capacity of moral perception into determinate practical principles, and thus society, which is originated by a sort of pathological compulsion, becomes metamorphosed into a moral unity." (Loc of p. 147)

"All the culture and art which adom humanity, the most refined social order, are produced by that unsociability which is compelled by its own existence to discipline itself, and so by entorced art to bring the seeds implanted by Nature into full flower" (Loc of p 118)

In these passages, as in others of this remarkable tract, Kant anticipates the application of the "struggle for existence" to politics, and indicites the manner in which the evolution of society has resulted from the constant attempt of individuals to strain its bonds. If individuality has no play, society does not advance, if individuality breaks out of all bounds, society perishes

But when men living in society once become aware that their welfare depends upon two opposing tendencies of equal importance—the one restraining, the other encouraging, individual freedom—the question. What are the functions of Government? Is translated into another—namely, 'What ought we men, in our corporate capacity, to do, not only in the way of restraining that free individuality which is inconsistent with the existence of society, but in encouraging that

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tree individuality which is essential to the evolution of the social organisation? The formula which truly defines the function of Government must contain the solution of both the problems involved and not merely of one of them

Locke his furnished us with such a formula, in the noblest, and at the same time briefest statement of the purpose of Government known to me—

# "THE END OF GOVERNMENT IS THE GOOD OF MANEIND"

But the good of mankind is not a something which is absolute and fixed for all men, whatever their capacities or state of civilisation. Doubtless it is possible to imagine a time "Civitas Del." in which every man's moral faculty shall be such as leads him to control all those desires which run counter to the good of mankind and to cherish only those which conduce to the welfare of society, and in which every man's native intellect shall be sufficiently strong, and his culture sufficiently extensive, to enable him to know what he ought to do and to seek after. And, in that blessed State, police will be as much a superfluity as every other kind of government.

But the eye of man has not beheld that State, and is not likely to behold it for some time to

<sup>·</sup> Of Oicil Government, § 229.

come What we do see, in fact, is that States are made up of a considerable number of the ignorant and foolish, a small proportion of genuing knaves, and a sprinkling of capable and honest men, by whose efforts the former are kept in a reasonable state of guidance, and the latter of repression. And such being the case, I do not see how any limit whatever can be laid down as to the extent to which, under some circumstances, the action of Government may be rightfully carried.

Was our own Government wrong in suppressing Thugger in India? It not, would it be wrong in putting down any enthusiast who attempted to set up the worship of Astaite in the Haymarket? Has the State no right to put a stop to gross and open violations of common decency? And if the State has, as I believe it has, a perfect right to do all these things, are we not bound to admit, with Locke that it may have a right to interfere with

Poperv" and 'Athersm," it it be really true that the practical consequences of such beliefs can be proved to be injurious to civil society? The question where to draw the line between those things with which the State ought, and those with which it ought not to interfere, then, is one which must be left to be decided separately for each individual case. The difficulty which meets the statesman is the same as that which meets us all in individual life, in which our abstract

rights are generally clear enough though it is frequently extremely hard to say at what point it is wise to cease our attempts to enforce them

The notion that the social body should be organised in such a manner as to advance the welfare of its members, is as old as political thought, and the schemes of Pluto More, Robert Owen, St. Simon. Cointi, and the modern socialists bear witness that, in every age, men whose capacity is of no mean order, and whose desire to benefit their fellows has rarely been excelled, have been strongly, my, enthusiastically, convinced that Government may attain its civil—the good of the people—by some more effectual process than the very simple and easy one of putting its hands in its pockets, and letting their alone.

It may be, that all the schemes of social organisation which have hitherto been propounded are impracticable follows. But if this has the fact proves, not that the idea which underlies them is worthless, but only that the science of policies is in a very radimentary and imperfect state. Politics, as a science, is not older than astronomy, but though the subject-matter of the latter is vastly less complex than that of the former, the theory of the moon's motions is not quite settled yet

Perhaps it may help us a little way towards getting clearer notions of what the State may and

what it may not do, if assuming the until of Locke's maxim that. The end of Government is the good of mankind," we consider a little what the good of mankind is

I take it that the good of mankind means the attainment, by every man, of all the happiness which he can enjoy without diminishing the happiness of his fellow men.<sup>1</sup>

If we inquire what kinds of happiness come under this definition, we find those derived from the sense of security or peace; from wealth, or commodity, obtained by commerce from Artwhether it be architecture, sculpture, painting, music, or literature, from knowledge, or science; and, finally from sympathy, or friendship. No man is injured, but the contrary, by peace No man is any the worse off because another acquires wealth by trade, or by the exercise of a profession on the contrary, he cannot have acquired his wealth, except by benefiting others to the full extent of what they considered to be its value, and his wealth is no more than fairly gold if he does not go on benefiting others in

<sup>1.</sup> His est itaque finis ad quem rendo, talem schoet Naturam arquitete et ul multi mecum eam requirint, conari hie est de mea a lieitate et uno peram due, ut ilu multi idem adque ego intelligant, ut communitellectus et cupiditas promis cum meo intellectu et cupiditate convenint arque hoc hat, necesse est tantum de Natura intelligant, quantum sifficit al talem naturam acquirendam dende formate talem societatem qualis est denderanda, ut quam plummi quam freilline et acme co pervemant '—B SPINGAA, De Intellectús Emembricose Tractative

the same way A thousand men may enjoy the pleasure derived from a picture, a symphony, or a poem, without lessening the happiness of the most devoted connoisseur. The investigation of Nature is an infinite pasture-ground, where all may graze, and where the more bite, the longer the grass grows, the sweeter is its flavour, and the more it nourishes. If I love a friend, it is no damage to me, but rather a pleasure, if all the world also love him and think of him as highly as I do.

It appears to be universally agreed for the reasons already mentioned that it is unnecessary and undesirable for the State to attempt to promote the acquisition of wealth by any direct interference with commerce. But there is no such agreement as to the further question whether the State may not promote the acquisition of wealth by indirect means. For example may the State make a road, or build a harbour, when it is quite clear that by so doing it will open up a productive district, and thereby add enormously to the total wealth of the community? And if so, may the State, acting for the general good, take charge of the means of communication between its members, or of the postal and telegraph services? I have not yet met with any valid argument against the propriety of the State doing what our Government does in this neatter. except the assumption, which remains to be



proved, that Government will manage these things worse than private enterprise would do Nor is there any agreement upon the still more important question whether the State ought, or ought not, to regulate the distribution of wealth If it ought not, then all legislation which regulates inheritance—the Statute of Mortmain, and the like—is wrong in principle and, when a rich man dies, we ought to return to the state of Nature and have a scramble for his property If, on the other hand, the authority of the State is legitimately employed in regulating these matters, then it is an open question, to be decided entirely by evidence as to what tends to the highest good of the people, whether we keep our present laws, or whether we modify them At present the State protects men in the possession and enjoyment of their property, and defines what that property is The justification for its so doing is that its action promotes the good of the people If it can be clearly proved that the abolition of property would tend still more to promote the good of the people, the State will have the same

Again, I suppose it is universally agreed that it would be useless and absuid for the State to attempt to promote friendship and sympathy between man and man directly. But I see no reason why, if it be otherwise expedient, the State

justification for abolishing property that it now

has for maintaining it

may not do something towards that end inductly For example I can conceive the existence of an Established Church which should be a blessing to the community A Church in which, week by week, services should be devoted, not to the iteration of abstract propositions in theology but to the setting before men's minds of an ideal of true, just, and pure living, a place in which those who are weary of the burden of daily cares, should find a moment's rest in the contemplation of the higher life which is possible for all, though attained by so few, a place in which the man of strite and of business should have time to think how small, after all, are the rewards he covets compared with peace and chairty. Depend upon it, if such a Church existed, no one would seek to disestablish it

Whatever the State may not do, however, it is universally agreed that it may take charge of the maintenance of internal and external peace. Even the strongest advocate of administrative nihilism admits that Government may prevent aggression of one man on another. But this implies the maintenance of an army and navy, as much as of a body of police, it implies a diplomatic as well as a detective force, and it implies, further, that the State, as a corporate whole, shall have distinct and definite views as to its wants, powers, and obligations.

For independent States stand in the same



relation to one another as men in a state of nature, or unlimited freedom. Each endeavours to get all it can until the inconvenience of the state of war suggests either the formation of those express contracts we call treaties, or mutual consent to those implied contracts which are expressed by international law The moral rights of a State rest upon the same basis as those of an individual If any number of States agree to observe a common set of international laws, they have, in fact set up a sovereign authority or supra-pational government, the end of which, like that of all governments, is the good of mankind, and the possession of as much freedom by each State as is consistent with the attainment of that end But there is this difference—that the government thus set up over nations is ideal, and has no concrete representative of the sovereign power, whence the only way of settling any dispute finally is to fight Thus the supra-national society is contimually in danger of returning to the state of nature, in which contracts are void and the possibility of this contingency justifies a government in restricting the liberty of its subjects in many

ways that would otherwise be unjustifiable
Finally, with respect to the advancement of science and art. I have never yet had the good fortune to licar any valid reason alleged why that corporation of individuals we call the State may not do what voluntary effort fails in doing, either

from want of intelligence or lack of will. And here it cannot be alleged that the action of the State is always hurtful. On the contrary, in every country in Europe, universities, public libraries, picture galleries, museums, and laboratories, have been established by the State, and have done infinite service to the intellectual and moral progress and the refinement of mankind

A few days ago I received from one of the most emment members of the Institut of France a pamphlet entitled "Pourquoi la France n'a pastrouvé d'hommes supérieurs au moment du péril" The writer, M. Pasteur, has no doubt that the cause of the astounding collapse of his countrymen is to be sought in the miserable neglect of the higher branches of culture, which has been one of the many disgraces of the Second Empire, if not of its predecessors

"An point ou nous sommes muivés de ce qu'on appelle la circlesation moderne, la culture des seiences dans leur expression la plus elevée est peut (tre plus nécessime encore à l'état moral d'une nation qu'à sa prospératé matérielle.

Les grandes deconvertes, les meditations de la pensée dans les aits, dans les sciences et dans les lettres, en un mot les travaux desintéressés de l'espirt dans tous les genres, les centres d'enseignement propres à les fune connutre, introduisent dans le corps social tout entier l'espirt philosophique ou scientifique, cet esfait de discernement qui sommet tout à une raison servire, condainne l'ignormée, dissipe les prejuges et les encuis. Ils elevent le mive in intellectuel, le sentiment moral, par eux, l'idée divine elle-même se répand et s'exalte. Si, au moment du péril suprême, la France n'a pas trouvé de hommes supérieurs pour mettre en œuvre ses ressources et

le courage de ses enfants il faut l'attribuer, j'en ar la conviction, à ce que la France s'est désintére-see, depuis un denn-siècle des grands travaux de la pensee particulièrement dans les sciences exactes '

Individually I have no love for academies on the continental model, and still less for the system of decorating men of distinction in science, letters, or art, with orders and titles, or emicling them with sinecures. What men of science want is only a fair day's wages for more than a fair day's work. and most of us. I suspect, would be well content if, for our days and nights of unremitting toil, we could secure the pay which a first-class Treasury clerk earns without any obviously trying strain upon his faculties. The sole order of nobility which, in my judgment becomes a philosopher, is that rank which he holds in the estimation of his tellow-workers, who are the only competent judges in such matters. Newton and Cuvier lowered themselves when the one accepted an idle knighthood, and the other became a baion of the empire The great men who went to their graves as Michael Faraday and George Grote seem to me to have understood the dignity of knowledge better when they declined all such meretricious trappings

But it is one thing for the State to appeal to the vanity and ambition which are to be found in philosophical as in other breasts, and another to offer men who desire to do the hardest of work for

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the most modest of tangible rewards, the means of making themselves useful to their age and generation. And this is just what the State does when it founds a public library or museum, or provides the means of scientific research by such grants of money as that administered by the Royal Society.

It is one thing, again, for the State to take all the higher education of the nation into its own hands; it is another to stimulate and to aid, while they are yet young and weak, local efforts to the same end. The Midland Institute, Owens College in Manchester, the newly-instituted Science College in Newcastle, are all noble products of local energy and munificence. But the good they are doing is not local—the commonwealth, to its uttermost limits, shares in the benefits they conter, and I am at a loss to understand upon what principle of equity the State, which admits the principle of payment on results, refuses to give a fair equivalent for these benefits on on what principle of Justice the State, which admits the obligation of shains the duty of primary education with a locality, demes the existence of that obligation when the higher education is m question

To sum up It the positive advancement of the peace wealth, and the intellectual and moral development of its members, are objects which the Government, as the representative of the corporate authority of society, may justly strive

after in fulfilment of its end-the good of mankind, then it is clear that the Covernment may undertake to educate the people. For caucation promotes peace by teaching men the realities of life and the obligations which are involved in the very existence of society, it promotes intellectual development, not only by training the individual intellect, but by safting out from the masses of ordinary or inferior capacities those who are competent to increase the general wilfare by occupying higher positions and, lastly, it promotes morality and refinement, by teaching men to discipline themselves, and by leading them to see that the highest, as it is the only permanent content is to be attained, not by grovelling in the rank and steaming valleys of sense, but by continual striving towards those high peaks, where resting in eternal culm reason discerns the undefined but bright ideal of the highest Good-"a cloud by day, a pillar of fire by night"

YOL I

## VII

## ON THE NATURAL INEQUALITY OF MEN

## [1890]

THE political speculations set forth in Rousseau's "Discours sur l'origine de l'inégalité parmi les hommes,' and in the more noted essay, "Du Contrat Social," which were published, the former in 1754 and the latter eight years later, are, for the most part, if not wholly, founded upon conceptions with the origination of which he had nothing to do The political, like the religious, revolutionary intellectual movement of the eighteenth century in France came from England Hobbes, primarily, and Locke, secondarily (Rousseau was acquainted with the writings of both), supplied every notion of fundamental importance which is to be found in the works which I have mentioned. But the skill of a master of the literary art and the fervour of a prophet combined to embellish and intensify the new presentation of old speculations which had the further good fortune to address itself to a public as tipe and ready as Balak humself to accept the revelations of any seer whose prophecies were to its mind

Missionaries, whether of philosophy or of religion, rarely make rapid way unless their preachings fall in with the prepossessions of the multitude of shallow thinkers, or can be made to serve as a stalking-horse for the promotion of the practical aims of the still larger multitude, who do not profess to think much, but are quite certain they want a great deal Roussean's writings are so adminably idapted to touch both these classes that the effect they produced, especially in France, is easily intelligible. For, in the middle of the cigliteenth century, French society (not perhaps so different as may be imagined from other societics before and since) picsented two large groups of people who troubled themselves about politics-in any sense other than that of personal or party intrigue. There was an upper stratum of luxumous idlers, jealously excluded from political action and consequently ignorant of practical affairs, with no solid knowledge or firm principles of any soit, but on the other hand open-minded to every novelty which could be apprehended without too much trouble, and exquisitely appreciative of close deductive reasoning and clear exposition. Such a public naturally welcomed Rousseau's bulliant developments of plausible first principles by the belp of that à prior, method which saves so much trouble-some investigation. It just suited the "philosophes," male and female interchanging their any epigrams in salons, which had about as much likeness to the Academy or to the Stoa, as the "philosophes" had to the philosophes of antiquity

I do not forget the existence of men of the type of Montesquieu or D'Argenson in the France of the eighteenth century, when I take this as a fair representation of the enlightened public of that day. The unenlightened public on the other hand, the people who were morally and physically debased by sheer hunger, or those, not so far dulled or inturated by absolute want, who yet were maddened by the wrongs of every description inflicted upon them by a political system, which so far as its proper object the welfare of the

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In his tances work on Ancient Lear the late Sn Henry Maine has remarked, with great justice, their Rousseau's philosophy still possesses singula insumitaritor for the loose thinkers of every country, 'that "it helped most powerfully to he agreement the grower disappointments of which the first frunch Revolution was tertile' and that 'it give both, or intense stimulus, to the vices of mental habit all but universal at the time, distant of positive law impatinge of experience, and the preference of a project of all other measuring (pr. 89-92). I shall often have to quote Ancient Law. The first edition of this admirable book was published in 1861, but now, after twentyming years of growing influence on thoughtful mean it seems to be integetten, or unfully ignored, by the rick of political speculators. It is enough to make one despan of the future that Demos and the Rouibons seem to be much alike in their want of capacity for either learning or togetting.

people, was concerned was effete and powerless, the subjects of a government smitten with paralysis for everything but the working of iniquity and the generation of scandals, these naturally hailed with rapture the appearance of the teacher who clothed passion in the garb of philosophy, and preached the sweeping away of injustice by the perpetration of further injustice as if it were nothing but the conversion of sound theory into practice

It is true that any one who has looked below the surface will hardly be disposed to join in the cry which is so often raised against the "philosophes' that their 'infidel and levelling' principles brought about the French Revolution People, with political eyes in their heads, like the Marquis'd Argenson, saw that the Revolution was inevitable before Rousseau wrote a line. In truth, the Bull "Unigenitis," the interested restricties of the Parliaments and the extravaginces and profligacy of the Court had a great deal more influence in generating the catastrophic than all the philosophes" that ever put pen to paper. But, undoubtedly, Rousseau's extremely attrictive and

These who desire to do so with ease and pleasure should read M Rouquest's L'Espr.' recolutionnaire en Irance amont la Levilation. It is really a luminous book, who he ought to be translated for the benefit of our using public men, who, having had the advineage of a public school education, are so often unable to read Fiend, with comfort. For deeper student there is, of course, the great work of M Tame, Les Origines de la France working return [An excellent condensed English version of M Recquary's book, by Mr-, J P Hanting, was published in 1891]

widely read writings did a great deal to give a colour of rationality to those principles of '891 which, even after the lapse of a century are considered by a good many people to be the Magna Charta of the human race. Liberty, Equality, and Fraterinty" is still the war-cry of those, and they are many, who think, with Rousseau, that human sufferings must needs be the consequence of the artificial arrangements of society and can all be alleviated or removed by political changes

The intellectual impulse which may thus be fault enough connected with the name of the Genevese dreamer has by no means spent itself in the century and a half which has clapsed since it was given. On the contrary, after a period of comparative obscurity (at least outside France), Rousscanism has gradually come to the front again, and at present promises to exert once more a very grave influence on practical life. The two essays to which I have referred are, to all appearance, very little known to the present generation of those who have followed in Rousseau's track. None the less is it true that his teachings, filtered

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I So H Mame observes that the "strictly juridical axiom" of the lawyers of the Antonius em ("ownes homines natura equales sunt"), after passing through the hands of Roussesi, and being adopted by the founders of the Constitution of the United States, returned to France endowed with vastly greater energy and dignity, and that "of all the principles of 1789 it is the one which has been least streamously assailed, which has nost thoroughly leavened modern opinion, and which promises to modify most deeply the constitution of sourches, and the politics of States" (Ament Law, p. 96)

through innumerable channels and passing under other names, are still regarded as the foundations of political science by the existing representatives of the classes who were so much attracted by them when they were put forth. My friend, Mr. John Morley who probably knows more about Rousseau and his school than anybody else, must have been entertained (so far as amusement is possible to the subject of the process of "heckling") when Rousseau's plats, the indigestibility of which he exposed so many years ago, were set before him as a wholesome British dish, the situation had a certain piquancy, which no one would appreciate more keenly

I happened to be very much occupied upon subjects of a totally different character, and had no mind to leave them, when the narrative of this occurrence and some letters to which it gave use appeared in the Times. But I have very long entertained the conviction that the revived Rousseamsm of our day is working sad mischief, leading astray those who have not the time, even when they possess the ability, to go to the root of the superficially plausible doctrines which are disseminated among them. And I thought it was

Alt I had not reason to think that Mr Morley's Rousseau, and Sir Henry Maine's Ancient Law, especially the admirable chapters III and IV, must be rinknown to many political writers and speakers and a fortiers to the general public, there would be no excuse for the present cases, which simply restates the case which they have so exhaustively treated

my duty to see whether some thirty years training in the art of making difficult questions intelligible to audiences without much learning, but with that abrudance of keen practical sense which characterises English workmon of the better class, would enable me to do something towards the counteraction of the faltaeio is guidance which is offered Perhaps I may be permitted to add that the subject was by no means new to me Very curious cases of communal organisation and difficult questions involving the whole subject of the rights of property come before those whose duty it is to acquaint themselves with the condition of either sea or treshwater fisheries, or with the administration of Fishery Lines. For a number of years it was my fate to discharge such duties to the best of my ability, and, in doing so, I was brought face to tace with the problem of landownership and the difficulties which arise out of the conflicting claums of commoners and owners in severalty And I had good scason to know that nustaken theories on these subjects are very hable to be translated into illegal actions not say whether the letters which I wrote in iny degree attained the object (of vastly greater importance, to my mind, than any personal question) which I had in view But I was quite aware, whatever their other results, they would probably involve me in disagreeable consequences, and, among the rest in the necessity of proving a

variety of statements, which I could only adunbrate within the compass of the space that the "Times" could afford me, liberal as the editor showed himself to be in that respect. What I purpose to do in the course of the present essay is to make good these shortcomings, to show what Rousseau's doctrines were, and to inquire into their scientific value—with, I hope, that impartiality which it beseems us to exhibit in inquires into ancient history. Having done this I propose to leave the application of the conclusions at which I arrive to the intelligence of my readers, as I shall thus escape collision with several of my respected contemporaries.

I have indicated two sources from which our knowledge of Rousseau's system may be derived, and it is not worth while to go any further. But it is needful to observe that the dicta of the author of the "Contrat Social, published in 1762, are not un-

I firm Mi Habert Spence, a letter in the Times of the 27th of November, 1889 I gather that he altogether reputates the doctrines which I am don't occurre. I rejock to hear it, in the first place, because they thus lose the shelter of his high authority secondly, because after this repudation, anything I may say in the course of the rellowing pages against Rousse rusin cannot be draggeeable to him and thirdly, because I desire to crinces my great regiet that, in however good company, I should have receded the intility new to preceive that Mi Spencer had previously rejudiated the views attributed to him by the land socialists. May I rake this opportunity of informing the mony correspondents who results to any on what I verture to write that I have no other answer to give them but Pilates "What I have written I have written". I have no energy to unsteen replies to irresponsible a tream

frequently very hard—indeed I might say impossible—to reconcile with those of the author of the 'Discours," which appeared eight years earlier, and that, if any one should maintain that the older essay was not meant to be taken seriously, or that it has been, in some respects, more or less set aside by the later, he might find strong grounds for his opinion It is enough for me that the same à prior i method and the same fallacious assumptions pervade both

The thesis of the carber work is that man in the 'state of nature" was a very excellent creature indeed, strong, healthy, good and contented, and that all the evils which have befallen him, such as feebleness, sickness wickedness and misery result from his having forsaken the "state of nature" for the "state of civilisation" And the first step in this downward progress was the setting up of rights of several property. It might seem to a plain man that the argument here turns on a matter of fact if it is not historically true that men were once in this 'state of nature" --- what becomes of it all? However, Rousseau tells us, in the preface to the 'Discours," not only that the 'state of nature" is something which no longer exists, but that "perhaps it never existed, and probably never will exist." Yet it is something "of which it is nevertheless necessary to have accurate notions in order to judge our present condition rightly" After making this singular statement, Rousseau goes on to observe "Il faudrait même plus de philosophie

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quon ne pense à celiu qui entreprendrait de déterminei exactement les précautions à piendre pour faire sur ce sujet de solides observations' And, certainly, the amount of philosophy required to base an argument on that which does not exist, has not existed, and, perhaps never will exist, may well seem unattainable—at any rate, at first sight Yet, apart from analogies which might be drawn from the mathematical sciences—where, for example, a straight line is a thing which has not existed, does not exist and probably never will exist, and yet forms a good ground for reasoning and the value of which I need not stop to discuss-I take it that Rousseau has a very comprehensible idea at the bottom of this troublesome statement What I concerve him to mean is that it is possible to form an ideal conception of what ought to be the condition of mankind, 1 and that, having done so we are bound to Judge the existing state of things by that ideal That assumption puts us on the "high priori road" at once

<sup>1</sup> Compare Ancient Law — "The Law of Nature confused the Past and the Present Logicalry, it implied a state of Nature which had once been regulated by Natural Law, yet the jurisconsults do not speak clearly or considently of the existence of such a state '(p 73) "There are some writers on the sulfect who attempt to evade the fundamental difficulty by contending that the code of Nature exists in the future and is the goal to which all civil laws are moving '(p 74). The jurisconsults conceived of Natural Law "as a system which ought gradually to absorb Civil Laws" (p 76). "Its functions were in short, remedial, not revolutionary or anarchical. And this unfortunately is the exact point at which the modern view of a Law of Nature has often ceased to resemble the ancient" (p 77)

I do not suppose that any one is inclined to doubt the usefulness of a political ideal as a goal towards which social conduct should strive, whether it can ever be completely realised or not; any none than any one will doubt that it is useful to have a moral ideal towards which personal conduct should tend, even though one may never reach it Certainly, I am the last person to question this, or to doubt that politics is as susceptible of treatment by scientific method as any other field of natural knowledge. But it will be admitted that, great as are the advantages of having a pulitical ideal, fashioned by an absolute rule of political conduct, it is perhaps better to do without one, rather than to adopt the first pinantasm, bied of fallacions reasonings and born of the unscientific imagination, which presents itself The benighted traveller, lost on a moor, who refuses to follow a man with a lantern is surely not to be commended. But suppose his hesitation arises from a well-grounded doubt as to whether the seeming luminary is anything but a will of the wisp? And, unless I fail egregiously in attaining

In the course of the correspondence in the Times to which I have referred I was carnestly exhorted to behave that the world of politics does not be cruside of the province of science. My impression is that I was trying to teach the public that great truth, which I had lawned from Mill and Comile, thirty hive years ago, when it I mistake not, my well meaning monitor was more occupied with peg tops than with politics. See a letture on the "Educational Value of the Natural History Sciences," delivered in 1814 (Law Sermons, p. 97)

my purpose, those who read this paper to the end will, I think have no doubt that the political lantern of Rousseauism is a mere corpse candle and will plunge those who follow it in the deepest of anarchic bogs.

There is another point which must be carefully borne in mind in any discussion of Rousseau's doctrines, and that is the meaning which he attaches to the word 'mequality". A hundred and fifty years ago, as now, political and biological philosophers found they were natural allies. Rousseau is not intelligible without Buffon, with whose earlier works he was evidently acquainted, and whose influence in the following passage is obvious—

It is easy to see that we must seek the primary cause of the differences by which men me disringuished in these successive changes of the human constitution, since it is universally admitted that they are, invarially, as equal uniong thouselves as were the animals of each species before various physical causes had produced, in some of them, the varieties which we observe. In fact, it is not concervable that these first changes, by whatever means they were brought about, altered at once and in the same way, all the individuals of a species, but some having become improved or deteriorated, and having acquired different qualities, good or bad, which were not inherent in their

The publication of Baffon's Manage Naturally negan in 1749. Thus Bousseau was indefined to the naturalists on the other hand in the case of the elder Drivin, who stated what is now usually known as Lamarch's hypothesis, the naturalist was set speculating by the ideas of the philosopher Hartley, reassnatted through Priestley. See Ze usuas, I see t xxxii p. 483 (ed. 1756). I hope some day to deal at length with this currons fact in scienting history.

nature, the others remained longer in their original state, and such was the first source of inequality among men, which is more easy to prove thus in a general way, than in assign exactly to its time causes—("Discours," Preface)

In accordance with this conception of the origin of inequality among men. Roussean distinguishes, at the outset of the "Discours, two kinds of inequality —

the one which I term natural or physical lecture it is established by Nature and which consists in the differences of age, health, bodily strength, and intellectual or spiritual quantities, the other, which may be called moral, or political, because it depends on a sort of convention, and is established, or it least authorised, by the consent of mankind. This last inequality consists in the different privileges which some enjoy to the prejudice of others, as being incher, more honoured, more powerful than they, or by making themselves obeyed by others

Of course the question readily suggests itself Before drawing this sharp line of demarcation between natural and political inequality, night it not be as well to inquire whether they are not intimately connected, in such a manner that the latter is essentially a consequence of the former? This question is indeed put by Rousseau bimself And, as the only answer he has to give is a piece of silly and insincere rhetoric about its being a question fit only for slaves to discuss in piecence of their masters, we may fairly conclude that he knew well enough he dare not grapple with it. The only safe course for him was to go by on the

other side and as far as the breadth of the road would permit, and, in the rest of his writings to play fast and loose with the two senses of inequality as convenience might dictate.

With these preliminary remarks kept well in view, we may proceed to the discussion of those fundamental theses of the "Discourse' and of the "Social Contract" which Rousseau calls the "principes du droit politique' Rousseau defines his object thus—

Le veux chercher si dans l'ordre civil il peut y avoir quelque règle d'unimissation legitime et que, en prenant les hommes tels qu'ils sont et les lous tels qu'elles peuvent être. Je tâcherai d'allier toujours dans cette recherche ce que le droit permet avec ce que l'interêt prescrit, afin que la ju tice et l'utilité ne se trouvent point divisées ?

In other words, our philosopher propounds "sure" that is 'absolute," principles which are, at once ethically and politically, sufficient rules of conduct, and that I understand to be the precise object of all who have followed in his track. It was said of the Genevese theorist "Le

I Compare Hobbes's dedication of Haman Nature written in 1640— They who have written of justice and pulsey in general, do all invade each other and themselves with contradictions. To reduce this doctrine to the rules and mills libry of reason there is no may, but, first, put such jumeigles down for a foundation, as passion, not mistrusting, may not seek to displace, and afterwards to build thereon the truth of exists in the law of Nature (which hitherto have been built in the air) by degrees, till the whole Lave been mayinguable. However, it must be recollected that Hobbes does not start from a priors principles of ethics, but from the practical necessives of men in society.

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genre humam avait perdu ses titres, Jean-Jacques les a retrouvés"; just as his intellectual progeny declare that the nation ought to "resume" the landed property of which it has, unfortunately lost the title-deeds

We are now it a position to consider what the chief of these principles of the gospel according to Joan-Jacques are—

- I All men are born tree, politically equal, and good and in the "state of nature" remain so, consequently it is then natural right to be free, equal, and (presumably, their duty to be) good "
- 2 All men being equal by natural right, none can have any right to encroach on another's equal right. Hence no man can appropriate any part of the common means of subsistence—that is to say, the land or anything which the land produces—without the unanimous consent of all other men. Under any other circumstances property is usingation, or, in plant terms, robbery?
- 3 Political rights, therefore, are based upon contract; the so-called right of conquest is no

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1 Contract Social, v. pp. 48, 99. The reference, beto given me to the volumes and pages of Mussay Pathaw's addition (1826). Discours, passant, see especially p. 268.

Descoure. In 257, 258-278 How many wild seemous have here presched on this test — Ignorez-vous qu'une multitude de vos treres perit ou soufite du beson de ce que vous aver de top, et qu'il vous fallait un consentement expres et unamme du genre numera pour cous approprier sur la subsistance commans tout ce qui alloit aidelà de la vétie."

right, and property which has been acquired by force may rightly be taken away by force.1

I am bound to confess, at the outset, that while quite open to conviction I incline to think that the obvious practical consequences of these propositions are not likely to conduce to the welfare of society, and that they are certain to prove as injurious to the poor as to the rich. Due allowance must be made for the possible influence of such prejudice as may flow from this opinion upon my further conviction that, regarded from a purely theoretical and scientific point of view, they are so plainly and demonstrably false that except for the gravity of their practical consequences they would be indiculous

What is the meaning of the famous phrase that 'all men are born free and equal," which gallicised Americans, who were as much "philosophes' as their inherited common sense and their practical acquaintance with men and with affairs would let them be, put forth as the foundation of the 'Declaration of Independence'? I have seen a consid-

Descure, pp. 276, 280. Contrat, chap in — Telle fut ou dut the" (charming alternative!) "longue de la société et des lois qui donnéent de nouvelles entaves au faille et de nouvelles forces au riche détruisment sans retoin la liberté naturelle, incrent pour jamus le loi de la propriété et de l'inegalité, d'une auroite usingation ment un dont mifrocable, et, pour le paofit de quehaus impatieur, assuptiment desormais tout le genre humain au travail à la scrivitade et à la misere" (Discours, p. 278). Behold the quintessence of Rodsseausin—method and result—with practical application legible by the swiftest lumer.

erable number of new-born infants. Without wishing to speak of them with the least disrespect-a thing no man can do without, as the proverb says. "fouling his own nest"—I fail to understand how they can be affirmed to have any political qualities at all. How can it be said that these poor little mortals who have not even the capacity to kick to any definite end, nor indeed to do anything but vaguely squum and squall, are equal politically, except as all zeros may be said to be equal? How can little creatures be said to be free" of whom not one would live to for and twenty hours if it were not impresoned by kindly hands and coerced into applying its foolish wandering mouth to the breast it could never find for itself? How is the being whose brain is still too pulpy to hold an idea of any description to be a moral agent either good or bad? Surely it must be a joke, and rather a cymical one too, to talk of the political status of a new-born child? But we may carry our questions a step further Il it is more aluacadabia to speak of mon being born in a state of political freedom and equality, thus fallaciously confusing positive equality—that is to say, the equality of powers-with the equality of impotences; in what concernable state of society is it possible that men should not mently be born, but pass through childhood and still remain free? Has a child of fourteen been free to choose its language and all the connotations with which

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words become burdened in their use by generation after generation? Has it been free to choose the habits enforced by piecept and more surely driven home by example? Has it been free to invent its own standard of right and wrong? Or rather, has it not been as much held in bondage by its surroundings and driven hither and thither by the scourge of opinion as a ventable slave, although the fetters and the whip may be invisible and intangible?

Surely, Aristotle was much nearer the truth un this matter than Hobbes of Rousseau. And it the predicate "burn slave" would more nearly agree with fact than "boin free," what is to be said about 'boin equal' Rousseau, like the sentimental thetorician that he was, and half or more than half, sham, as all sentimental thetoricians are, sagaciously fought shy, as we have seen of the question of the influence of natural upon political equality. But those of us who do not care for sentiment and do care for truth may not evade the consideration of that which is really the key of the position If Rousseau, instead of letting his children go to the enfants trouves, had taken the trouble to discharge a father's duties towards them he would hardly have talked so fast about men being born equal even in a political sense For, if that merely means that all new-born children are political zeros-it is, as we have seen though true enough, nothing to the purpose; while, if it means that, in their potentiality of becoming factors in any social organisation-citizens in Rousseau's sense-all men are born equal it is probably the most astounding talsity that ever was put forth by a political speculator, and that, as all students of political speculation will agree is saying a good deal for it In fact, nothing is more remarkable than the wide inequality which children, even of the same family, exhibit, as soon as the mental and moral qualities begin to mainfest themselves which is earlier than most people fancy Every family spontaneously becomes a polity. Among the children, there are some who continue to be "more honoured and more powerful than the rest, and to make themselves obeyed (sometimes, indeed, by then elders) in virtue of nothing but their moral and mental qualities Here, "political inequality" visibly dogs the heels of 'natural' mequality The group of children becomes a political body, a civitas, with its rights of property, and its practical distinctions of rank and power this comes about neither by force nor by flaud, but as the necessary consequence of the innate mequalities of capability

Thus men are certainly not born tree and equal in natural qualities, when they are born the predicates "free" and "equal' in the political sense are not applicable to them, and as they develop year by year, the differences in the political

potentialities with which they really are born become more and more obviously converted into actual differences-the inequality of political faculty shows itself to be a necessary consequence of the inequality of natural faculty. It is probably true that the earliest men were nomads But among a body of naked wander ing savages, though there may be no verbally recognised distinctions of tank or office, superior strength and cunning confer authority of a more valid kind than that secured by Acts of Parliament, there may be no property in things but the witless man will be poverty-stricken in ideas, the clever man will be a capitalist in that same commodity, which in the long run buys all other commodities, one will miss opportunities, the other will make them, and, proclaim human equality as loudly as you like, Witless will serve his brother. So long as men are men and society is society, human equality will be a dream, and the assumption that it does exist is as untrue in fact as it sets the mark of impracticability on every theory of what ought to be, which starts from it

And that last remark suggests that there is another way of regarding Rousseau's speculations. It may be pointed out that, after all whatever estimate we may form of him, the author of works which have made such a noise in the world could not have been a mere fool, and that if, in their plain and obvious sense, the doctrines which he

advanced are so easily upset, it is imbable that he had in his mind something which is different from that sense

I am a good deal disposed to think that this is the case. There is much to be said in favour of the view that Rous-can, having got hold of a plausible hypothesis, more or less uncon-ciously made up a clothing of imaginary facts to hide its real nakedness. He was not the first nor the last philosopher to perform this feat.

As soon as men began to think about political problems, it must have struck them that, if the man object of society was the welfare of its members (and until this became clear, political action could not have usen above the level of instinct 1), there were all soits of distinctions among men, and burdens laid upon them which no use contributed

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<sup>1</sup> It is not to be forgotten that what we call rational ground. tor our beliefs are often or tremely mational aftempris to justify our instincts. It innot doubt that human society existed before language or any othical consciousness. Gregatious and data to m polities in which they at a roding to rides conducted to the nolfare of the whole soviery although of course, it would be absurd to say that they oless laws in the initiated sonse. The John s of the masterless dogs in Eastern cries are well known And, in any street of an Aughsh town, one may observe a small dog chased by a bigger, who turns round the moment he has entered his own territory and metes the other, while, usually, after various manifestations of anger and contrapt, the bigger No doubt the small dog has had previous ex perience of the arrival of assistance under such inclinistances, and the big one of the effects of stocks and stones and other odd mussles no doubt, the associations thus engineed are the prime source of the practical acknowledgment of ownership on both sides. I suspect it has been vory much the same among

Even before the great leveller, to that end Rome, had actually thrown down innumerable social and national party-walls had absorbed all other for us of citizen thip into her own, and brought the inhabitants of what was then known as the would under one system of obligations-thoughtful men were discovering that it was desuable in the interests of society, that all men should be as free as possible, consistently with those interests; and that they should all be equally bound by the ethical and legal obligations which are essential to social existence. It will be observed that this conclusion is one which might be arrived at by observation and induction from the phenomena of past and present experience. My belief is that it is the conclusion which must be reached by those means when they are rightly employed-and that, in point of fact, the doctrines of freedom and equality, so far as they were preached by the Stores and others, would have had not the least success, if they had not been so far approved by experience and so far in harmony with human instincts, that the Roman jurists found they could work them up with effect into practical legislation. For the d priori arguments of the philosophers in the last century of the Republic, and the first of the Empire, stand examination no better than those of the philosophers in the centuries before and after the French Revolution. As is the fashion of speculators, they scorned to remain on

the sate, if humble, ground of experience, and preferred to prophesy from the sublime cloudland of the à priori, so that, busied with deduction from their ideal "ought to be" they overlooked the "what has been," the "what is," and the "what can be"

It is to them that we owe the idea of living 'according to nature", which begot the idea of the "state of nature", which begot the notion that the "state of nature" was a reality, and that, once upon a time, "all men were free and equal" -which again begot the theory, that society ought to be reformed in such a manner as to bring back these haleyon days of freedom and equality, which begot lasses faire and universal suffrage, which begot the theory so dear to young men of more ambition than industry, that, while every other trade, business, or profession acquires theoretical training and piactical skill, and would go to the dogs if those who carry them on were appointed by the majority of votes of people who know nothing about it and very little about them—the management of the affairs of society will be perfectly successful, if only the people who may be trusted to know nothing, will vote into office the people who may be trusted to do nothing

If this is the political ideal of the modern followers of Rousseau, I, for my part, object to strive after it, or to do anything but oppose, to the best of my ability, those who would fain drive us that way. Freedom, used foolishly, and equality,

asserted in words, but every moment denied by the facts of nature, are things of which, as it seems

to me, we have rather too much already. It J mistake not, one thing we need to Jean is the necessity of limiting individual freedom for the general good, and another, that, although decision by a majority of votes may be as good a roughand-ready way as can be devised to get political questions settled, yet that, theoretically, the despotism of a majority is as little justifiable and as dangerous as that of one man, and yet another, that voting power, as a means of giving effect to opinion, is more likely to prove a curse than a blessing to the voters, unless that opinion is the result of a sound judgment operating upon sound knowledge. Some experience of sca-life leads me to think that I should be very sorry to find myself on board a ship in which the voices of the cook and the loblolly boys counted for as much as those

course. And there is no sea more dangerous than the ocean of practical politics—none in which there is more need of good pilotage and of a single, unfaltering purpose when the waves rise high.

The conclusion of the whole matter, then, would

of the officers, upon a question of steering, or reefing topsails, or where the "great heart" of the crew was called upon to settle the ship's

seem to be that the doctrine that all men are, in any sense, or have been, at any time free and equal, is an utterly baseless fiction. Nor does the

proposition fare much better if we modify it, so as to say that all men ought to be free and equal, so long as the "ought" poses as a command of immutable morality For, assuredly, it is not intuitively certain 'that all men ought to be free and equal 'Therefore, if it is to be pistified at all  $\dot{\alpha}$ priori, it must be educible from some proposition which is intuitively certain, and aufortunately none is forthcoming. For the proposition that men ought to be free to do what they please, so long as they do not infringe on the equal rights of other men, assumes that men have equal rights and cannot be used to prove that assumption. And if, instead of appealing to philosophy we turn to revealed religion. I am not aware that either Judaism or Christianity attnins the political freedom or the political equality of men in Rousscau's sense. They affirm the equality of men before God-but that is an equality either of insignificance or of imperfection

With the demonstration that men are not all equal under whatever aspect they are contemplated, and that the assumption that they ought to be considered equal has no sort of à priori foundation—however much it may, in reference to positive law, with due limitations, be justifiable by considerations of practical expediency—the bottom of Rousscan's argument, from à priori ethical assumptions to the denial of the right of an individual to hold private property, falls out—For Rousseau, with more

logical consistency than some of those who have come after him, puts the land and its produce upon the same footing "Vous êtes perdus si vous oubliez que les fiuits sont à tous, et que la terre n'est à personne,' says he.1

From Rousseau's point of view (and, for the present, I leave my other aside) this is, in fact, the only rational corclusion from the premisses The attempt to draw a distinction between land. as a limited commodity, and other things as unhmited, \*is an obvious fallacy For according to him,2 the total habitable surface of the earth is the property of the whole human ince in common Undoubtedly, the habitable and cultivable land amounts to a definite number of square miles, which, by no effort of human ingenity, at present known or suspected, can be sensibly mereased beyoud the area of that part of the globe which is not covered by water, and therefore its quantity is limited. But if the find is limited, so is the quantity of the trees that will grow on it, of the cattle that can be pastified on it, of the crops that can be raised from it, of the minerals that can be dra from it, of the wind and of the water-power, afforded by the Limited streams which flow from the limited heights. And, if the human race were to go on increasing in number at its present rate. a time would come when there would not be stand

<sup>[1]</sup> Which may be Englished in bind, "Crops an everyholy and land is nobody '] - As to Hobbes, but on different grounds

ing ground for any more; if it were not that, long before that time, they would have eaten up the limited quantity of food-stuffs and died like the locusts that have consumed everything eatable in an oasis of the desert. The attempt to draw a distinction between land as limited in quantity, in the sense. I suppose, that it is something that caunot be imported—and other things as unlimited because they can be imported—has ansen from the fact that Rousseau's modern followers entertain the delusion that, consistently with their principles, it is possible to suppose that a nation has right of ownership in the land it occupies. If the island of Great Britain is the property of the British nation, then, of course, it is true that Britons cannot have more than somewhere about 90,000 square nules of land, while the quantity of other things they can import is (for the present, at any rate), mactically, if not strictly, unlimited But how is the assumption that the Britons own Britain, to be reconciled with the great dictum of Rousseau, that a man cannot rightfully appropriate any part of this limited commodity, land, without the unanimous consent of all his fellow men? My strong impression is that if a parti-coloured plebiscite of Europeans, Chinese, Hindoos, Negroes, Red Indians. Maons, and all the other inhabitants of the terrestrial globe were to decree us to be usurpers, not a soul would budge, and that, if it came to fighting. Mi Morley's late "hecklers" might be safely

depended upon to hold then native soil against all intruders, and in the teeth of the most absolute of ethical politicians, even though he should prove from Rousseau.

"Exceedingly well
That such conduct was quite athorious

Rousseau's first and second great doctrines having thus collapsed, what is to be said to the third?

Of course, if there are no rights of property but those based on contract, conquest, that is to say, taking possession by force, of itself can confer no right But, as the doctime that there are no rights of property but those based on the consent of the whole human race—that is, that A B cannot own anything unless the whole of mankind formally signify their assent to his ownership-turns out to be more than doubtful in theory and decidedly inconvenient in practice, we may inquire if there is any better reason for the assertion that force can confer no right of ownership. Suppose that in the old seafaring days, a pirate attacked an East Indiaman—got soundly beaten and had to surrender When the priates had walked the plank or been hanged, had the captain and crew of the East Indiaman no right of property in the prize-I am not speaking of mere legal right, but ethically? But if they had, what is the difference when nations attack one another; when there is no way out of then quarrel but the appeal to force, and the one that gets the better serzes more or less of the other sterritory and demands it as the place of peace? In the latter case, in fact, we have a contract, a price paid for an article—to wit peace—delivered, and certain lands taken in exchange, and there can be no question that the buyer's title is based on contract. Even in the former alternative I see When they declared war, the little diflerence parties knew very well that they referred their case to the arbitrament of force, and if contracts are eternally valid, they are fully bound to abide by the decision of the arbitrator whom they have elected to obey Therefore, even on Hobbes's or Rousseau's principles, it is not by any means clear to my mind that force, or rather the state of express or ticit contract which follows upon force, successfully applied, may not be plausibly considered to confor ownership

But if the question is argued, as I think it ought to be, on empirical grounds—it the real question is not one of imagined dipitori principle, but of practical expediency—of the conduct which conduces most to human welfare—then it appears to me that there is much to be said for the opinion that force effectually and thoroughly used, so as to render further opposition hopeless, establishes an ownership! which should be recog-

A Submission to the Revolution of 1688 by Luchter could be advocated ethically on no other ground, though all soits of prefexts were invented to disguise the fact

msed as soon as possible. I am greatly disposed to think, that when ownership established by force has endured for many generations, and all sorts of contracts have been entered into on the faith of such ownership, the attempt to disturb it is very much to be deprecated on all grounds For the welfare of society, as for that of individual men, it is surely essential that there should be a statute of limitations in respect of the consequences of wrong-doing. As there is nothing more fatal to nobility of personal character than the nursing of the teeling of revenge-nothing that more clearly indicates a barbarous state of society than the carrying on of a wendetta, generation after generation, so I take it to be a plain maxim of that political ethic which does not profess to have any greater authority than agreeableness to good feeling and good sense can confer, that the evil deeds of former generations-especially if they were in accordance with the practices of a less advanced civilisation and had the sanction of a less refined morality-should, as speedily as possible, be torgotten and buried under better thmes

'Musst immer thun wie neu geboren" is the best of all maxims for the guidance of the life of States, no less than of individuals. However, I express what I personally think, in all humility in the face of the too patent fact, that there are persons of light and leading—with a political

authority to which I can make not the remotest pretension, and with a weight of political responsibility which I rejoice to think can never jest on my shoulders-who by no means share my opinion. but who, on the contrary, deem it right to fan the sparks of revenge which linger among the embers of ancient discords, and to stand between the dead past and the hving present, not with the healing purpose of the Jewish leader, but rather to intensity the plague of political strife, and hold aloft the brazen image of the father's wrongs, lest the children might perchance forget and forgive

However, the question whether the tact that property in land was originally acquired by force mvalidates all subsequent dealings in that property so completely, that no lapse of time, no formal legalisation, no passing from hand to hand by free contract through an endless series of owners, can extinguish the right of the nation to take it away by force from the latest proprietor, has rather an academic than a practical interest, so long as the evidence that landed ownership did so ause is Potent an organon as the de priori method may be, its employment in the region of history has rarely been found to yield satisfactory results, and, in this particular case the confident assertions that land was originally held in common by the whole nation, and that it has been con-



verted into severalty by force as the outcome of the military spirit rather than by the consent, or contract, characteristic of industrialism, are singularly ill-founded

Let us see what genuine lustory has to say to these assertions Pethaps it might have been pardonable in Rousseau to propound such a statement as that the primitive landowner was either a robber or a cheat, but, in the course of the century and a half which has clapsed since he wrote, and especially in that of the last fifty years, in immense amount of information on the subject of ancient land-tenure has come to light, so that it is no longer pardonable, in any one to content himself with Rousscan's ignorance. Even a superheral glance over the results of modern investig is tions into authropology, archaeology, ancreat law and ancient religion, suffices to show that there is not a particle of evidence that men ever existed in Rousseau's state of nature, and that there are very strong reasons for thunking that they never could have done so, and never will do so

It is, at the least, highly probable that the nomadic preceded any other social state, and, is the needs of a wandering hunter's or pastor's life are far more simple them any other, it follows that the inequalities of condition must be less obvious among nomads than among settled people. Men who have no costume it all, for example, cannot be said to be unequally clothed, they are, doubt-

less, more equal than men some of whom are well clothed and others in rags though the equality is of the negative sort. But it is a profound mistal of to anagme that, in the nomadic condition, any more than in any other which has yet been observed, men are either "free" or 'can'l in Rousseau's sense I can call to a and no nomadic nation in which women ite on in equality with men, nor any in which young men are on the same footing as old men, nor any to which tamily groups, bound together by blood ties by their mutual responsibility for bloodshed and by common worship, do not constitute corporate political units, in the sense of the city of the three's and Romans A "state of natine" in which noble and peaceful but mide and monerabless, savages sit in solitary meditation under the sambes they are dining or amusing themselves mother was without cares of responsibilities of my soft is emply another figuret of the inscientific magnificen The only uncrywheed men of whom anything is really known are hampened by superstitutes and enslaved by conventions, as strange as those at the most artificial societies, to an almost meredildedegree Furthermore, I think it may be said with much confidence that the primitive claud-



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I may remain the moment that in their origin deserve πολες and enthremon, not an agengation of homes, but it corporation. In this sense, the City of London is formed by the free men of the City, with their Common Conneillers, Aldermen, and Lord Mayor.

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grabber "did not either force or cheat his coproprietors into lotting him fence in a bit of the land which hitherto was the property of all

The truth is we do not know and mobably. never shall know completely, the nature of all the various processes by which the ownership of land was originally brought about. But there is excellent ground for sundry probable conclusions in the fact that almost all parts of the world and almost all namons, have yielded evidence that, in the earliest settled condition we can get at, I aid was held as salvate or several property, and not as the property of the public, or general body of the nation. Now private or several money to may be held in one of two ways. The ownership may be vested in a single individual person, in the ordinary sense of that word, or it may be vested in two or more individuals, forming a cornoration or legal person, that is to say, an onlyty which has all the duties and responsibilities of an individual person but is composed of two or more individuals. It is obvious that all the againers which Rousseau uses against individual landownership apply to corporate landownership. If the rights of A. B. and C are individually not, you camel reake any more of your 0 by multiplying it by three (A BC) -the composition -- must be

<sup>&#</sup>x27; For the difficulties which attach to the establishment of such probably conclusion; see the remarkable work of M. Fustel de Conlonges—becker lassic qualques modulines de History. Las Gardinais.



an usurper if A, B, and C taken each by himself is so. Moreover, I think I may take it for granted that those who desire to make the State universal landowner, would eject a corporation from its estates with even less hesitation than they would expel an individual

The particular method of early landholding of which we have the most widespread traces is that in which each of a great number of moderatesized portions of the whole territory occupied by a nation is held in complete and inflerible ownership! by the males of a family, or of a small number of actual or supposed kindled families, mutually responsible in blood fends, and worship ping the same God or Gods No female had any share in the ownership of the land. If she married outside the community she might take a share of the moveables, and, is a rule, she went to her husband's community. If, however the community was short of hands, the husband might be taken into it, and then he acquired all the rights and responsibilities of the other members. Children born in the community became full members of it by domicile, so to speak, not by heredity from their parents. This primitive "city" was lodged in one or more dwellings, each usually standing in a patch of inclosed ground, of arable land in the immediate neighbourhood of the

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<sup>&</sup>lt;sup>1</sup> Inalituable, that is, without the consent of the whole owning community

dwellings, while pastine and uncleared forest land try outside all. Each commune was as jerlous of its rights of ownership as the touchiest of squires, but so long as the population was as sounty in proportion to the occupied territory as was usually the case in ancient times, the communtles got along pretty peaceably with one another. Any notion that all the communities which made up the nation had a sort of corporate overloadship over any one, still more that all the rest of the world had any right to complain of then "appropriation of the mems of subsistence," most assuredly never entered the heads of our forefathers. But, alongside this corporate several ownership, there is strong ground for the belief that individual ownership was recognised to a ecitain extent, even in these early times. The inclosure around each dwelling was understood to belong to the family inhabiting the dwelling, and, for all practical purposes, must have been as much owned by the head of it as a modern entitled estate is owned by the possessor for the time being. Moreover, if any member of the community chose to go outside and clear and cultivate some of the waste, the reclaimed land was thenceforth recognised as his that is to say, the right of ownership, in virtue of labour spent was admitted !

<sup>&</sup>lt;sup>1</sup> Roussean himself not only whents, but masts on the validity of this claim in the Contrat Sound, by 1 chap as

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Thus it is obvious that though the early landholders were, to a great extent, collective owners the imaginary rights of mankind to universal landownership, or even of that of the nation at large to the whole territory occupied were interly ignored; that so far from several ownership being the result of force or feared it was the system established with universal assent, and that from the inst, in all probability individual rights of property, under certain conditions, were fully recognised and respected. Roussean was therefore, correct in suspecting that his state of nature" had never existed -- it never did, her anything like it But it may be said, supposing that all this is time and supposing that the doctrine that Englishmen have no right to their approprinting of English soil is nonscince it must, nevertheless, be admitted that, at one time, the great body of the nation, consisting of these numerous landowning corporations, composed of comparatively poor men, did own the land And it must also be admitted that now they do not but that the land is no the hands of a relatively small number of actually or comparatively uch proprietors who constitute perhaps not one per cent of the population. What is this but the result of robbery and cheating? The descendants of the robbers and ent-theort soldiers who came over with William of Normandy, have been true to their inflitary instincts, and have "conveyed" the

property of the principle corporations into their own possession. No doubt, that is history undecase, but bear once more, fact and a priori speculations cannot be made to in

Let as look at the case dispassionately, and by the light of real history. No doubt, the early system of land tenure by collective several ownership was excellently inhapted to the encumetances in which mankind found thomselver. If it had not been so, it would not have endured so long, nor would it have been adopted by all sorts of different races -from the aucrest frish to the Unidoos, and from the Russians to the Kaffas and Japanese. These enemystaires were in the man as tollows. That there was plenty of land unoccupied, that population was very scarty and increased slowly, that wants were sample, that people were content to go on hime in the same way, generation after generation, that there was no commerce worth speaking of, that mannfactores were really than which they are eigenologically -things made by the builds, and that there was no need of expet it in the shape of meney Moreover, with such methods of wartare is thou existed the system was good for detence and not but for oftence

Yet even if left to itself, to develop unitisimbedly without the intrusion of force, fruid of inditation in my shape the communal system, like the individual owner system or the States



owner system or any other system that the wit of man has yet devised, would sooner or later have had to face the everlasting agrain difficulty And the more the communities enjoyed general health peace, and plenty, the sooner would the pressure of population upon the means of support make itself felt. The difficulty paraded by the opponents of individual ownership, that by the extension of the private appropriation of the means of subsistence, the time would arrive when men would come into the world for whom there was no place, must needs make its appearance under any system unless mankind are prevented from multiplying indefinitely. For, even it the habitable land is the property of the whole human race the multiplication of that race must, as we have seen sooner or later, bring its numbers up to the maximum which the produce our support, and then the interesting problem in casus(iv which even absolute political ethics may find puzzling, will arise Are we, who can just exist bound to advoit the newcomers who will simply starve themselves and us! If the rule that any one may exercise his freedom only so far as he does not interfere with the freedom of others is all-sufficient, it is clear that the newcomers will have no rights to exist at all, mismuch as they will interfere most senously with the freedom of their predecessors. The population question is the real indile of the sphing, to which no political Œdipus has as

yet found the answer. In view of the rayages of the terrible monster, over-multiplication all other riddles sink into insignificance

But to return to the question of the manner in which individual several ownership has, in our own and some other countries, superseded communal several ownership. There is an exceedingly instructive chapter in M de Laveleye's well-known work on "Primitive Property, entitled "The Origin of Inequality in Landed Property" And I select M de Laveleye as a witness the more willingly, because he draws very different conclusions from the facts he so curefully adduces to those which they appear to me to support

After enumerating various countries in which, as M de Laveleye thinks, mequality and an airstocracy were the result of conquest, he asks very pertmently--

But how were they develope I in such countries as Germany, which know nothing of conquerous coming to create a privileged caste, those a variouslied, and custived population ase so in Germany's sociations of free and independent persents like the inhabitints of Uri Schwyz, and Unterwilden at the present day. At the close of the middle ages we find, in the same country a feudal mistocracy resting more heavily on the soil and raistic population more completely enslaved than in England, Italy, or Prince (p. 222)

The author proceeds to answer the question which he propounds by showing, in the first place, that the admission of the right of individuals and their heas to the land they had reclaimed, which

was so general, if not universal, created hereditary individual majority alongside the communal property, so that private estates arose in the waste between the sparse communal estates Now, it was not every family or member of a community that was enterprising chough to go out and clear waste lands, or that had the courage to defend its possessions when once obtained. The originally small size of the domains thus acquired, and the strong stimulus of personal interest, led to the introduction of better methods of cultivation than those traditional in the communes And, finally, as the private owner got little or no benefit from the community, he was exempted from the charges and corners laid upon its members. The result as may be imagined, was that the private proprietors, aided by serf-Labour prospered more than the communities cultivated by then free members, somously hampried them by occupying fresh waste lands, yielded more produce, and turnished wealth, which, with the help of the majorat system, remained concentrated in the hands of owners who, in virtue of their possessions, could maintain ictainers, while, freed from the need to labour they could occupy themselves with war and the chase, and, as nobles attend the sovereign. On the other hand, then brothern, left behind in the communes, had little chance of growing individually tich or powerful, and had to give themselves up to

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agricultural toil. The Bishop of Oxford, in his well-known 'Constitutional History of Figured' (vol 1, p. 51), puts the case as his wont is concisely and precisely. 'As the population increased, and agriculture itself improved, the nurk system must have been superseded everywhere. No doubt, when the nobles had once established themselves, they often added force and fraud to their other means of inlarging their borders. But, to begin with the inequality was the result not of militarism, but of industrialism. Clearing a piece of land for the purpose of cultivating it and reaping the crops for one's own advantage is surely an industrial operation, it ever there was one

Secondly M de Laveleye points out that the Church was a great devourer of commune lands --

"We know that a racible of the commune could only dispose of his share with the consent of his associates, who had a right of resumption, but this right could not be exercised against the Church. Accordingly, in these days of religious fervour, the faithful frequently left to the Church all that they possessed, not only then house and its inclosure, but the undivided share in the mark attached to it. (p. 225). Thus an abbot or a bishop, became co-proprietes with the peasants of a commune, and, with such a cuckoo in the nest, one can conceive that the hedge-sparrows might have a bid time. "Already

by the end of the mith century one-third of the whole soil of Gaul belonged to the dergy" (p. 225). But, if the men who left their property to the Chinch believed that they got their quid pro quo in the shape of masses for their soils, as they certainly did and if the Churchmen believed as smeerely (and they certainly did) that they gave valuable consideration to the property left them, where does fraud come in . Is it not again a truly industrial operation? Indeed, a keenwitted and eminent Scotch judge once called a huge bequest to a Church 'fire insurance," so emphatically commercial did the transaction appear to him

Thirdly, personal several property was carved out of the corporate communal property in another fishion, to which no objection can be taken by industrialism. Plots of arable land were granted to includers of the commune who were skilled artificers, as a salary for their services. The craft transmitting itself from father to son the land went with it and grow into an hereditary benefice.

Fourthly, Sir Henry Maine 1 has proved in a very striking manner, from the collection of the Brehon Laws of ancient Ireland, how the original communal landownership of the sept with the allotment of an extra allowance of pasture to the chief, as the honorarium for his services of all

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<sup>1</sup> See Eurly History of Institutions, expanially Lecture vi

kinds, became modified, in consequence of the power of keeping more cattle than the rest of the sept, thus conferred on the chief. He became a lender of cattle at a high rate of interest to his more needy sept-tellows, who when they borrowed became bound to do him service in other ways and lost status by falling into the position of his debtors. Hence the cluef gradually acquired the characteristics of what naturalists have called 'synthetic' and "prophetic types, combuning the features of the modern gombeen-man with those of the modern rack-renting landlord, who is commonly supposed to be a purely imported Norman or Some product, saturated with the very spirit of undustrialism--namely the determination to get the highest price for an article which is to be had. As a fact, the condition of the native bish under their own cluefs was as bad in Queen Elizabeth's time as it has ever been Again, the status of the output commoners of the sept was steadily diered for the worse by the privilege which the chief possessed. and of which he ficely availed himself, of actiling on the waste land of the commune such broken vagabonds of other timbes as sought his patrologe and protection and who became absolutely dependept upon him. Thus, without was and without any necessity for force or fraud (though doubtless there was an adventitious abundance of both), the communal system was bound to go to pieces, and

to be replaced by individual ownership, in consequence of the operation of purely industrial causes. That is to say in consequence of the many commercial advantages of individual ownership or a communal ownership which became more and more marked exactly in proportion as territory became more fully occupied, security of possession increased and the chances of the success of individual enterprise and skill as against routine, in an industrial occupation, became greater and greater

The notion that all individual ownership of land is the result of force and fraud appears to me to be on a level with the peculiarly short-sighted projudice that all religions are the results of specialistic cuming and imposture. As religious are the movitable products of the human mind, which generates the priest and the prophet as much as it generates the faithful, so the inequality of individual ownership has grown out of the relative equality of communal ownership in virtue of those natural inequalities of men, which, if unimpeded by circumstances, cannot fail to give rise quietly and peaceably to corresponding political inequalities.

The tisk I have set myself is completed, as far as it can be within reasonable limits. I trust that those who have taken the trouble to follow the argument, will agree with me that the gospel

of Jean Jacques in its relation to property is a very sorry affau—that it is the product of an intrustworthy method applied to assumptions which are devoid of foundation in fact, and that nothing can be more profoundly true than the saying of the great and truly philosophical English jurist whose recent death we all deplore, that speculations of this sort are rooted in "impatience of experience and the preference of a priori to all other methods of reasoning."

Almost all the multitudinous causes which concurred in bringing about the French Revolution are happily absent in this country, and I have not the slightest few that the preaching of my amount of political fallacy will rivolve us in evils of the magnitude of those which accompanied that great diama But seeing how great and manifold are the inevitable sufferings of men, how profoundly important it is that all should give their best will and devote their best intelligence to the alleviation of those sufferings which can be diminished by seeking out and, as far as hics within human power removing their causes, it is surely lamentable that they should be drawn away by speculative chimæras from the attempt to find that narrow pith which for vations as for individual men, is the sole road to perminent well-berne,

## $_{ m VIII}$

## NATURAL RIGHTS AND POLITICAL RIGHTS

## [1890]

In looking through a series of critical notices the other day, my eye was caught by a remark upon my essay 'On the Natural Inequality of Mon' —to the cliect that it was well enough, but why should I have taken all that trouble to slay the slain'

Evidently, the propounder of the question believes that the doctrines of that school of political philosophers of which Rousseau was the typical representative, are not only killed but dead. But, whatever may hold good of men, doctrines do not necessarily die from being killed. Many a long year ago, I fondly imagined that Hume and Kant and Hamilton having sluin the "Absolute," the thing must, in decency, decease. Yet at the present time, the same hypostatised negation, sometimes thinly disguised under a new name,

goes about in broad daylight, in company with the dogmas of absolute ethics, political and other, and seems to be as lively as ever. It would seem to be to no purpose that the history of every branch of physical and historical science teems with examples of the fate which befalls the hasty generaliser who numbers, rather than weight, supposed facts and treats the rough approximations to truth obtained by the observation of highly complex phenomena as if they had the precision of geometrical theorems.

There is unfortunately, abundant evidence that the vicious method of it prior i political speculation which I have illustrated from the writings of Rousseau is not only in full vigour, but that it is exerting an influence upon the political action of our contemporaries which is extremely serious. No better evidence of the fact need be adduced than the avidity with which the writings of political teachers of this school have been and are being read, especially among the more intelligent of the working classes and I doubt if any book published during the last ton years has obtained a luger enculation among them, not only in this country but in the United States, than 'Progress and Poverty" The other day there was a rumour that some devoted disciple of its author, Mr Henry George, had bequeathed a large sum of money to him in order to aid in the propagation of his doctames

In some respects, the work undoubtedly deserves the success which it has won. Clearly and vigorously written, though sometimes weakened by superfluous rhetorical confectionery. Progress and Peverty. leaves the reader in no doubt as to Mr. George's meaning, and thus fulfils the primary condition of honest literature. Nor will any one question the author's intense conviction that the adoption of his panacea will cure the ills under which the modern state groans.

Mi George's political philosophy is, in principle though by no means in all its details, identical with Rousseausm - It exhibits, in perfection, the same dymora method starting from leghly questionable axioms which are assumed to represent absolute truth and asking us to upset the existing arrangements of society on the faith of deductions from those axioms The doctrine of "natural rights is the fulcium upon which he, like a good many other political philosophers, during the last 130 years, rests the lever wherewith the social world is to be litted away from its present foundations and deposited upon others. In this respect, he is at one, not only with Rousseau and his conscious or unconscious followers in France and in England, but, I regret to say, may claim the countenance of a far more scientifically minded and practical school of political thinkers—that of the French Physiocrates of the eighteenth century

The founder of this school, Quesniy, the saga-

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cious physician of Louis the Fifteenth, whom even that graceless prince appreciated and called his "thinker," was an cinimently practical man, especally conversant with agriculture As the name taken by his disciples implies his toaching was, professedly, based upon careful observation of and induction from, the course of nature, as it bears upon politics. It would hardly be too much to say that we owe to the Physiociates the modern clearness of conviction that the world of human society is as much the theatre of order and definite sequence of cause and effect as the world of extrahuman nature that there are rules of action the observance of "hich brings about prosperity, while then neglect cutails ruin, which have nothing to do with the laws of morality or with the ordinances of religion, and that the wicked who follow these rules will not beg then bread, while the prous who neglect them will But Quesnav and his tollowers would have been more than mortal if they had escaped the influence of the spirit of their age, and though they nover fell into the speculative monstresities of Rousseau vet, about the time that the latter was occupied with his essay on 'Inequality." Quesnay composed that short work entitled "Lo Droit Naturel," which is all too largely intected by the dornar method

Queenay begins by laying down the proposition that "Natural Right" may be "vaguely defined" as 'the right which a man has to the things which

are fit for his enjoyment. Truly a vague enough definition, and one that would need a great deal more defining before it could be sately turned to any mactical account Quesnay's friend and collaborateur, Dupont de Nemours, in the introductory discourse prefixed to the collection entitled "Physiocratic ou constitution naturelle gouvernement le plus avantageux au genie bumain,' published in 1765, has somewhat improved upon it "Natural Right," he says, is 'the night a man has to do that which is to his advantage. He considers that this right is founded upon the condition that we are "charged with our own preservation under penalty of suffering and death" And he adds 'The final degree of punishment decreed by this sovereign law is superior to every other interest and to every arbitrary law" 'Natural Right," then, is the right of a man to do anything necessary for his own preservation, and to possess himself of any means of enjoyment. It is possessed to its full and literal extent by any and every wholly isolated man "Natural Right, by this account of it, must vest in the individual before he has entered rato the social state, and must be antecedent to all forms of relative justice and injustice But the contemporaneous and contiguous existence of many such individuals, all of whom assert their natural rights, must also necessarily end in the Hobbesian state of war of each against all, unless

they agree to conventions which shall allow to each his natural right to things enjoyable, or, in other words, his freedom to profit by the advantages which he is competent to obtain from the order of nature 1

There seems to me to be a wonderful admixture of wholesome truth and of very unwholesome fiction in these propositions and, as is not uncommon, the fiction has become popular while the truth is neglected. Indeed, Quesnay himself saw deeper than his disciple, and writes thus in the opening chapter of the treatise I have cited (Daire, p. 41) —

He who has said that the natural right of man is a mullity has spoken truly

He who has said that the natural night of man is the right which nature teaches to all animals has spoken truly 3

He who has said that the natural right of man is the right which his strength and his intelligence assure him has spoken truly

He who has said that natural right is himited to the private interest of each man has spoken truly

Dane Physical ates Partie premiire, pp. 19, 20
 In a note Quesnay says "This is the definition of Justinian ' It would be more accurate, I imagine, to say that it is derived from Ulpian - Jus naturile est quod naturi omna animaha docuit num jus istud non humani generis proprium sed omnium mimahum." It is to the same Romin jurist that we owe the maxim that ill men according to the It of Nature, are equal and ire "Quod adjust intuiale it inct, onnes homines asquides sunt" "Quod adjustintuiale it inct, libert nuscerentur" See the exhaustive work of Voigt Das jus naturale equam et bonum und jus gentium der Romer, Ed 1, § 56, whence these citations are taken

He who has said that a datal right to a general and sovereign law, which regulates the rights of all men. I as a oken trola

He who has said that the natural right of mon is the unlimited right of all to everything has spoken truly

He who has said that the initial light of men is a right limited by a truit of explinit convention has spoken truly

He who has said that natural light has nothing to do noth either justice or main free has spoken truly 1

He who has said that natural right is a just decreive and undamental right, has spoken truly

But none has spoken truly in relation to all cases

What is one to make of this litary of antinomies? Quesnay lumself seems to have been
content to leave the riddle unanswered—while his
successors do not appear to have understood that
there was a riddle to answer. Each proposition
may certainly be plausibly justified, and yet
contradicts or is hard to reconcile with, some
other. Now when this is the case, we may be
pretty sure that the difficulty arises from some
ambiguity of language. If "Natural Right" is
susceptible of these opposing predicates, it must be
that it stands for two or more widely different
ideas. I propose to endeavour to show that this
solution of the difficulty is correct.

Some time as I fell in with an Indian tiger story of a peculiarly gruesome sort, and I repeat the substance of it, not from any especial love for

I in a note Queen to observes that this is the case of a man clone to a desertishmed whose natural right to the products of the island involves neither justice nor injustice massimal as these terms express the relations of two or more persons

horrible stories, but because the tale led me, and therefore may easily lead my readers, into a train of fruitful reflections upon this very question of 'Natural Rights'

A tigiess cairied off an unfortunate Indian villager—as a cat may carry off a mouse—without doing the man any mortal injury Tracked to her lair in the jungle, the brute was seen to set don't the half-disabled captive before her cubs, who commenced mumbling and wanling him to the best of their infantine ability, while the tender mother complacently watched their clumsy efforts to deal with the big game sne had brought home But, if the man driven desperate, succeeded for a moment in beiting off his small termenters and crawling away a few yards a judiciously administered grip with the thoughtful parent's strong jaws, or a cuff from her heavy and sharp-clawed paw, at once reduced the victim to a state in which the cubs could safely resume their worrying and scratching

I suppose that no one in whose imagination these words suffice to body forth a vision of the thing will fail to be horrified at the apparently wanton infliction of such grievous mental and bodily torture upon a harmless peasant, nor think, without satisfaction, of the justice done by the infle-shots that eventually laid the tigress and her terocrous progeny low. The assertion that the tigress had a "natural right" to do what she did,

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or that she and her cubs were justified by the "Law of Nature" in their course of action, will perhaps seem to most a monstrous, if not a wicked, doctine. Yet this very doctrine is implicitly inculcated in one of the most familiar works of an author from whom the youthful mind half a century ago derived its earliest impressions of othics, and also, unfortunately of poetry. The young people of that day were taught to repeat.

'Let dogs debah to bark and hise
For his ther nature to
Let bears ind hous groud and fight,
For God hath made them so'

As poetry, this pions doggerel is undoubtedly nought But, as moral philosophy mue, may even aged reflection must, I think, satisfy us that it is not only sound, but has the ment of patting the case in a untshell whatever agers and tigresses may be and do, it is guite clear, if we adopt the creative hypothesis and believe that God made them, that He made them so' The acts which we are pleased to denounce as wantonly cruel are, therefore, necessary and intentional consequences of the divine creative operation. In fact, if there is evidence of intention anywhere in the fabric of things, the study of the structure of one of the cats, great or small, will prove it to be a machine most admirably adapted to slav and teur to pieces other hving qualitypeds, and will demonstrate that if it was intended to do anything, it must have been intended to perform exactly that butcher's work which it executes so well

On the other hand if we prefer to say no more than there is good evidence for saying, it is unquestionably true that the "nature" or innate tendency of the whole race of traces is to prey on other large animals men included, masmuch as not only is their bodily and mental constitution especially ritted for that operation, but since they must perish if they fail to perform it Tigers (as M Dupout says of men) are charged with then own preservation under negative of death. Moreover, when we inquire into the just history of these predaceous animals, we find that the cats, great and small, are but the last term of a long series of species of animals most of which are now extinct, which have succeeded one another through the tertiary epoch, therefore, for many thousands or more probably millions of years, and which, in their capacity of butchering machines have undergone a steady though slow and gradual improvement, every step of which has been emeted at the expense of an envincous rotal of suffering to the animals butchered If, then, we deny that tigers have a natural right to torment and devent men, we really impeach, not the couduct of the tigers, but the order of nature if we ourselves, with our notions of right and

wrong are like the tigers products of that order, whence comes our competence to deny the exercise of their natural rights to those beings who stand upon the same foundation of natural right as ourselves? To say that a thing exists in nature and to say that it has a natural right to existence ite. in fact, merely two ways of stating the same truth which is that in nature, fact and justification of the fact, or in other words, nught and right, To be and to have a natural are coextensive right to be to possess a faculty and to have the natural right to exert it, are all one really must be admitted that the hymnologist of my childish days has reason on his side children's little hands ' were made to tear each other's eyes' or not it does not lie with us to object to tigets, any more than to dogs or bears, or hons growling and tighting as their natures dictate Beyond a doubt by the 'Law of Nature,' which is the foundation of 'natural right,' the cuts and then commorous allies are justified

Having thus established the rights of tigers to the exercise and empyment of the faculties with which nature has endowed them, it will be interesting to follow out the logical development of the doctrine, such as might be expected from a thoroughgoing advocate of those rights. It is admitted that a tiger has a natural right to cut a man, but if he may eat one man he may eat another so that a tiger has a right of property in

all men, as petential tiger-meat. Men are as much the "gratuitous offering of nature to tigers for their subsistence, or part subsistence, as finits are to men. But any one tiger has no increnatural right of property in men than any other tiger. All tigers are free to eat any man they can seize and if two tigers are sneaking along through the jungle on opposite sides of a footpath, then rights to the villager, who, travelling thereby fondly magnes he is going bome me equal So that we may safely enunciate the conclusion that all tigers have an equal natural right to eat all mcn

I think it would be difficult to object to this argument on purely logical grounds, and the conclusions to which we are forced appear startling enough, but here we stop. If the advocate of the 'rights of tigers' attempts to drive us into the further admission that as tigers have a right to cat men, it is wrong of men to put obstacles in the may of their having their rights by refusing to be eaten we protest against the doctrine not on the low and selfish ground of mere personal interest but hecause, however plansible, it is a patent fallacy. The champion of the 'rights of tigers' has, in fact, made a convenient, though unwarrant able jump from one sense of the word right" to another—from "initial right" to moral right ' No doubt, he who hinders of refuses to about a moral right is morally wrong—impost or, if you

will, wicked But very little consideration will show that hindrance or demal of 'natural rights" may not only be far from wrong but is, in fact, a necessary consequence of the existence of such "natural rights" Grant that the tiger kills and eats men in the exercise of his natural night to preserve his own existence, and to do that for which nature has expressly fitted him it is no less true that men kill tigers in the exercise of their equal natural right to preserve their existence If the tiger is entitled by the law of nature to use his claws and teeth and soft-footed stealthy cleverness for the purpose of his self-preservation. the man may employ his hands and the weapons they are so admirably adapted to fabricate and wield, and use his still greater dinning, in tracking and stalking tigers to the like end

Thus the natural rights of tigers and the natural rights of men, though quite indisputable and alike safely founded on the Law of Nature," are diametrically opposed to one another. It follows, therefore, that they are rights to which no correlative duties correspond—rights of which the exercise may be impeded, or prevented, without the perpetration of wrong. And that is just the difference between 'natural laws and rights," on the one hand, and 'moral and civil laws and rights 'on the other. Moral laws and civil laws are commands of an authority which may be disobeyed, but the sanctioning authority threatens



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and visits with penalties those who disobey "Thou shalt not steal," the negative form of the recognition of rights of property, is both a moral and a civil law. It rests on the authority either of a Deity, or on that of conscience, or on that of some civil person whose dominion is recognised, and its sanction, or penalty, incurred by disobedience, is hell or remoise or imprisonment, or all three

The proper object and effect of moral and civil laws are to benefit all who are subjected to them by bringing about a state of peace and mutual confidence—the laws restraining each individual from acts which are huitful and encouraging those which are beneficial to the polity of which he is a member On the contrary, the "Law of Nature" is not a command to do, or to refrain from doing anything. It contains, in reality, nothing but a statement of that which a given being tends to do under the circumstances of its existence, and which in the case of a living and sensitive being it is necessitated to do, if it is to escape certain kinds of disability, pain, and ultimate dissolution. The natural right deduced from such a law of nature is simply a way of stating the fact, and there is, in the nature of things, no reason why a being possessing such and such tendencies to action should not carry them into effect Confused with moral and civil laws and translated into the language of command, the

law of nature would bid the individual  $D_{i'}$ what you will, so far as you can" But it is only mexactly and by way of metaphor, that we can speak of disobedience to a law of nature or of penalties for such disobedience If, by impossibility, a tiger were to have an attack of the philozac and vegetarian fanaticism which is going about, and to declare that he would neither kill nor eat flesh any more, he would undoubtedly undergo a linguring and painful death by starration. But there is neither disobedience nor penalty The laws of nature are statements of tendencies, and if one law expresses the truth, that tigers which kill and eat will live and wax fit, another expresses the converse truth, that if tigers do not kill and eat, they will war lean and die The results are cousequences of two modes of action, both of which are in accordance with natural law (or they could not occur) and not rewards or penalties. Indeed, that they cannot be the latter is clear from the further truth, that the tiger who has grown old in doing his best to fulfil the first "law of nature," as with age his lumbs grow stiff and his tusks wear down, falls, very much against his will, under the second "law" and dies as miserably of starvation as if he had refused to kill and out on the loftiest of antivivisection and vegetarian principles

The crown of the differences between the "law of nature" with its consequent "natural rights"

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and moral or civil laws hes in this that consistent and thoroughgoing action, based upon the law of nature and the natural rights which flow from it, tends to benefit the individual at the expense of all other individuals whose needs and desires are of the same kind, and, so far from bringing about a state of peace among such mdividuals necessitates a state of war-that is to say of either conscious or unconscious competition among them The conseless and pitiless "struggle for existence' which obtains throughout the whole world of living things is, in truth, the inevitable consequence of the cucumstance that each living being strives knowingly, or ignorabily, to exert all its powers for the satisfaction of its needs and asserts a tacit claim to possess (to the exclusion of other beings) all the space on the earth's surface which it can occupy and to appropriate all the subsistence which it can utilise? The state of sentient nature, at any given time. is the resultant of the momentarily balanced oppositions of millions upon millions of millividuals, each doing its best to get ill it can ind to keep what it gets, each, in short, zealously

I Sixteen centuries also, Ulman drew the conclusion that according to the pus natural," the elements 'maic, 'acci," and, at any rate 'flitora' are the common property of all living through Isodore of Seville (see Ving' 1 576) probably founding himself on Ulman reckors 'communis omnum possessio et omnum unital eras requisito communique capument as among the natural rights of men

obeying the law of nature and fighting tooth and nail for its natural rights. This is the ne plus altra of individualism, and, wherever individualism has unchecked sway, a polity can no more exist than it can among the tigers who inhabit the same jungle. It is, in fact, the sum of all possible anti-social and anarchic tendencies

Even among tigers (or at any rate tigrosses). however, pure individualism does not always dominate When the tigress has brought forth her cubs, and while she is nourishing, protecting, and training them, she and they enter into an association, formed of individuals held together by the attraction of the instructs which constitute the animal basis of sympathy, and thus constitute a polity however small its scale and short its And it will be observed that this most duration rudimentary of polities the family, could not exist without the renouncement, on the part of the tigress at least, of some of the 'Rights of Tigers' The tigress no longer acts upon her natural right or eating all she kills, for example, she acts as if she were conscious of duties towards her cubs The cubs, on the other hand, are fould and more or less obedient, acting as if they had correlative duties towards their parent. It will not be supposed, I hope, that I suggest that either tigress or cubs are capable of entertaining moral ideas, all that I desire to point out is that, partly by instinct, partly by the effects of very sample experiences,

both sides perform acts which a more developed intelligence symbolises by these moral ideas

I have pointed out in the course of this discussion that among the jurists of old Rome, who first systematically developed the conceptions of the 'Law of Nature" and "Natural Rights,' Ulpian rightly judged that brutes came under such law and had such rights no less than men. It is obvious that, without recurrence to that "state of nature" of mankind of which so very much is said and so very little known, an individual man. isolated from his fellows and removed from all social relations, comes under the same law of nature, and has "natural rights' in exactly the same sense as the individual tiget possesses them Before the advent of man Friday, Robinson Crusoe's right and might were coextensive, except in so far as he might be influenced by remembrance of the moral and civil laws of his former social There was no reason why he should existence. abstain from doing anything it pleased him to do, and which lay within the scope of his natural faculties. No one would denv that he had a natural right to take possession of his cave, to cut down the trees that suited his purpose, to gather fauts, to kill any of the wild goats for his subsistence, to shoot any number of the cannibal visitors, who would otherwise kill him for their subsistence Crusoe's natural rights" thus

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potentially extended over the whole island and everything in it According to the law of nature as defined by Quesnay, he was owner of everything therein which he desired and was able to appropriote. Suppose, however, that another wieck had simultaneously east Will Atkins upon the opposite shore, and that Atkins had established himself there in Crusoc's fashion, then it is plain that the law of nature would confer upon him rights no less extensive Crusoe and Atkins. stalking the same goat from opposite sides, would have been in a position identical with that of two tigers in the jungle, slinking after the same Hindoo, so fat as the law of nature is concerned And if each insisted upon exerting the whole of his natural rights, it is clear that there would be nothing for it but to fight for the goat. In the case of the mon, as in that of the brutes, extreme and logical individualism means isolation and the state of war, it is plainly incompatible with the peace and co-operation which are the essentials of even temporary association. On the other hand, if the two men followed the dictates of the commonest common sense, not less than those of natural sympathy, they would at once agree to unite in peaceful co-operation with each other, for their mutual comfort and protection. And that would be possible only if each agreed to limit the exercise of his natural rights so far as they might involve any more damage to the other than to himIII

selt. This is to say the two men would, in reality, renounce the law of nature, and put themselves under a moral and civil law, replacing natural

rights, which have no wrongs, for moral and civil rights, each of which has its correlative wrong. This, I take it, is the root of truth which saves the saying of Paul of Taisus that 'sin came by the law' from being a paradox. The solitary, individuals.

nature, which cannot be violated, and having rights the contradictions of which are not wrongs, cannot sin. Wrong-doing becomes possible only when, by associating with another man, or other men, for peace and co-operation, the individual becomes implicitly, or explicitly, bound to observe

dual man, living merely under the so-called law of

certain rules of conduct in relation to him or them, any violation of these rules is a wrong

Probably none of the political delusions which

have sprung from the "natural rights" doctrine has been more mischievous than the assertion that all men have a natural right to freedom, and that those who willingly submit to any restriction of this freedom, beyond the point determined by the deductions of à priori philosophers, deserve the title of slave. But to my mind, this delusion is incomprehensible except as the result of the error of confounding natural with moral rights. It is undoubtedly true that a man, like a tiger or any other animal, has a natural right to freedom, if by

mere individual being, there is no reason why he should not do what he pleases. But that is a very harmless proposition, and neither despot nor slaveowner need boggle at it If, on the other hand, the champion of freedom means, as he usually does, that the natural right to freedom affords, in itself a ground for objecting to this or that restrint upon the liberties of mon who torin a polity the argument appears to me to be as sophistical as it is muschievous. For as we have seen. it is a necessary condition of social existence that men should renounce some of their freedom of action; and the question of bow much is one that can by no possibility be determined a priori That which it would be tyranny to prevent in some states of society it would be madness to permit in The existence of a polity depends upon the adjustment of the two sets of forces which its component units, the individual men, obeythe repulsive of natural right and the attractive and coactive of individual sympathy and corporate dominion. Which of them ought to predominate at any given time must surely depend upon external and internal circumstances and upon the degree of development of the polity. The Duke of Wellington is said to have defined martial law as "the will of the Commander-in-Chief for the time being"—that is to say, it is the sweeping away of all nights," natural, cavil, and moral, except so far as they are sanctioned by the

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commander Yet, surely, no one but a lunation can maintain that in case of invasion or rebellion. threatening the social person—the polity—with destruction, that composite man has not as much natural right to take any measure essential to self-preservation as an individual man has under the law of nature. And from this extreme case, to the petty question, as to whether the depositary of dominion in a polity has or has not the right to infringe the "natural right" of a man to leave the path in front of his house unswept of snow, there is an endless gradation in the importance of the problems, all of which can be solved only by the application of the same principles it, or is it not, for the welfare of society at that time and under those circumstances-looking at the question all round and taking fully into account the disadvintages of restraint of libertythat its members should be compelled to do this, or be restrained from doing that?

The political delusions which spring from the 'natural rights' doctrine are multitudinous; but I think there is only one more which is worth attention at present. That is the extraordinary notion that the logical consequence of the "notural right" of all men to any given thing is the sharing of the rights of property in that thing equally among all the claimants. Let us suppose two boys, John and Peter. I take an apple out of my pocket, and I say, "This apple is entirely yours, John and, Peter.

it is also entirely yours. The whole apple belongs to each of you, and you have each a right to ear the whole of it. Now, my boys, you may eat it. so long as neither of you gives up any fraction of the right I have given him nor infringes the other's right" The boys, I take it, would be somewhat puzzled If their common sense, plus their appetites, were stronger than their logical faculty, they would probably suggest that they should divide the apple and each eat half. But I should have to say "No You are violating my conditions -which were that you should neither of you give up any portion of his right to the whole. The arrangement you propose necessitates that John should give up his right to one half, and Peter his right to the other" Not improbably, my young friends, if of English extraction, might propose another way out of the difficulty; namely, the wager of battle. But again I should have to refuse. The trial by battle would unfortunately involve the infringement of the natural nights of the vanquished by the victor, which is, once more contrary to my stipulation. In fact, under the conditions stated, the apple would have to remain uneaten

Thus we see once more, that the absolute "natural rights" theory—that is to say individualism pure and simple-if carried out logically, is merely reasoned savagery, utter and immitigated selfishness, incompatible with social existence

And this would be obvious to every one, were it not that the ambiguous sense of the word "rights" gives a moral colour to human relations which are norther moral nor immoral, but, as Quesnay rightly says, antecedent to morality

My readers may imagine that I have forgotten 'Progress and Poverty' By no means, the preceding pages must, in fact, be regarded as a sort of "Prolegomena" to that work and especially to the first chapter of the seventh book, which contains the theoretical foundation of the practical measure which its author advocates

According to Mr George, society is very ill, and he proposes a method of treatment professedly based upon strict deduction from the principles of absolute political physiology Whether the remedy is calculated to achieve the results predicted. or not, is a question I shall not now discuss, but of will be admitted that it is drastic, consisting as it does in neither more nor less than the eviction of all several landowners and the confiscation of that which is and, for many centuries has been, regarded as then undoubted property measure is of exactly the same order as would be the confiscation of the interest of all money belonging to working-men in savings banks, on the ground that interest, as usury, is contrary to the principles of absolute ethics—an opinion which it must be remembered has been (perhaps still is)

supported by papal infallibility, which is, at least, equal in weight to the philosophical species of that commodity Surely the medicine is a strong Now I humbly submit, that while one medicine might take Epsom salts, on the recommendation of the first old woman who proposed that remedy for a sick headache, a rational man would like to have clearly intelligible reasons, or extremely trustworthy authority, before the ventured with an equally light heart, upon croton oil or tartai emetic The latter might certainly put an end to his sick headache—but what if at the same time it put an end to him? So, it is at any rate possible, that the expropriation of landowners, while it might put an end to a state of things inconsistent with the minciples of absolute political ethics, might also destroy the society it strove to heal Therefore, I think we are bound to see that Mr. George's 'absolute" principles are "absolutely" true before we act upon even the most logical of deductions from them Without presumption, it may be said to be just possible that the principles may be unsound and the deductions fallacious

In the chapter to which I have referred, the author sets out by putting the question, What constitutes the rightful basis of property? And I have conscientiously endeavoured to set torth, accurately, the essentials of his answer in the following abstract of it

I All men have equal rights

The laws of nature are the decrees of the Creator There is written in them no recognition of any right save that of labour, and in them is written broadly and clearly the equal right of all men to the use and enjoyment of Nature to apply to her by their exertions and to receive and possess her reward. Hence, as Nature gives only to labour, the exertion of labour in production is the only title to exclusive possession. ("Progress and Poverty," 1889 p. 287.)

II. There is no foundation to any rightful title to ownership except this. That a man has a right to himself, to the use of his own powers, to the enjoyment of the fruit of his own exertions (p. 236), therefore, to whatsoever he makes or produces

HI The right to that which is produced is "vested" in the producer by natural law (p 236) It is also a fundamental law of Nature that her enjoyment by man shall be consequent upon his exertion" (p 241).

IV Land is a gratuitous offering of Nature, not a thing produced by labour (p. 238), all men therefore have equal rights to it (p. 239). These rights are inalienable, as existing men cannot contract away the rights of their successors (p. 240). Every infant who comes into the world has as good a right to landed estates as their present possessors, by whom he is, in fact, robbed of his share (p. 240).

This, I believe is a complete, it a succinct, statement of Mi George's case. And I, for one, am quite prepared to admit that, if it can be

sustained, the sooner the foundations of our present polity are broken up and replaced by something less open to objection, the better. But even Mi George, I imagine, will admit that the enterpise is grave, and by no means to be undertaken with a light heart, still less with that superficial intellectual apprehension which comes of a light head. The political philosopher who uses his à priori lever, knowing that it may stir up social discord without the most conclusive justification, to my mind comes perilously near the boundary which divides blunders from crimes

The several elements of the proposition which I have quoted under I might have been taken almost ici batim from the writings of the Rousseaurtes and the Physiocrats But it is one of the most interesting features of à priori speculation, that different philosophers, starting from verbally identical propositions, arrive at contradictory conclusions And the Physiociats deduced the right and the necessity of maintaining several ownership of land from the principles common to them and Mr. George, as confidently as, and, in my judgment, with much better reason than, Mr George deduces its hideous wrongfulness and the paramount necessity of abolishing it equality of men question has already been sufficiently discussed It, as I maintain, there is no such thing as natural equality among men then of course any argument based upon it is necessarily worthless. From the fact that men are unequal it cannot well be concluded that they have "equal rights to the use and enjoyment of nature"

Passing from this point, we are met by the broad assertion that "the exertion of labour in production is the only title to exclusive possession". So far Mr George is at one with the Physiocrats, who also rest the claim to ownership on labour bestowed. Let us consider the grounds upon which Mr George rests this assertion. We need not trouble ourselves whether they are the same or different from those set forth by his predecessors.

The following questions and answers enlighten us on this head

What constitutes the rightful basis of property? What is it that enables a man to say justly of a thing, 'It is mine"? Is it not, primarily, the right of a man to himself, to the use of his own powers, to the enjoyment of the trusts of his own exertions? ("Progress and Poverty," p. 236.)

And, on the same page we are told that the title to everything produced by human exertions "descends from the original producer, in whom it is vested by natural law". Here we are back again on the ground of the "law of nature" and "natural rights" according to which, as we have seen, a man has a right to keep anything he is strong enough to keep, whether he has produced it or not. But the

law of nature affords not the least reason why another man who is stronger should not take his possession away from him

As I have aheady fully shown, there is not the least connection between the natural rights of the solitary individual and the moral or civil rights of the man who has entered into association with others. A man may justly say that it is no more than the "use of his own powers," to knock another down and rob him of his dinner, and that it is no more than "the enjoyment of the finits of his own exertions" to proceed to eat that dinner. Is it pretended that the man who has entered into association with others retains those "natural rights"?

But let us assume, for the sake of argument, not only that labour is the 'only" title to exclusive possession, but that the foundation of this title hes in the right of a man to himself, and in which 18, somewhat sophistically included the right to the use of his own powers and the enjoyment of the truits of his own exertions. If we my to believe both these propositions at once, surely we fall into perplexities worse than any that have vet betallen us. If labour is the only title to exclusive pussession; if, for example, there can be no exclusive possession of cultivated land simply and solely because according to Mr. George, it is not a product of labour-propositions on the axiomatic certainty of which the whole tablic of Progress and Poverty" rests-how in the world does a man

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come by the "right to himself '? I have paid a good deal of attention to those branches of natural history which treat more especially of man but never yet have I come across even the smallest grounds for believing that a man has ever been known to make himself, or to endow himself by his own labour with the powers he exerts have heard often enough of men who were said to Indeed, I have known some cases be self-made in which the fact was alleged in justification of the ways of Providence, and for the purpose of shifting the responsibility for the existence of some people on to the right shoulders have always taken this phrase about "selfmaking ' to be a metaphor, and a very foolish one, inasmuch as the men said to be self-made are usually those whom nature has especially tavoured with costly gifts and exceptional oppor-No doubt it may be said, with justice, that a man who learns diligently and strives hard to do right, really bestows labour on himself, and does so far fulfil the necessary conditions of selfownership laid down in 'Progress and Poverty" But, on the other hand, might not his teachers, on the very same ground, claim possession of the fruits of their labours in lim? Might not the mother, who not only bore him but bore with him, day and night, for half-a-closen years, fed him, clothed hun, nursed him in sickness, taught him the rudinents of civilisation—night not she

rightfully appeal to this wonderful labour-test of ownership?

Is there any logical way out of the following argumentation, the like of which is perhaps to be found only in "Alice in Wonderland"? The exertion of labour in production is the only title to exclusive possession. No gratuitous offering of Nature can be the subject of such private owner-Therefore a man can have no exclusive possession of himself, except in so far as he is the product of the exertion of his own labour and not a gratuitous offering of Nature But it is only a very small part of him which can in any sense be said to be the product of his own labour man's physical and mental tendencies and capacities, dependent to a very large extent on heredity. are certainly the 'graturtous offering of Nature." if they belong to anybody, therefore, they must belong to the whole of mankind, who must be, so to speak, a kind of collective slaveowners, all of So much of the man as depends on the care taken of him in infancy and childhood is the property of his mother, or of those who took her place Another smaller portion belongs to the people who educated him What remains is his own. So that the man's right to himself and to all his powers and to all the fruits of his labour. which the writer of "Progress and Poverty" makes the foundation of his system, turns out if we follow another fundamental proposition of the

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same author to its logical consequences, to be a right to a mere fraction of lumself and to the exercise of the powers which exclusively belong to that fraction. Surely it would take a greater sage than Solomon to settle the respective claims of mankind in general the mother and the educators, to the ownership of a child, and when these were satisfied, what might remain in the shape of

a right to himself would be hardly big enough to

form a safe basis for anything, let alone property. Unless my readers can see their way better than I can through this logic-chopping maze, we must give up the attempt to reconcile the two fundamental propositions of the system we are disthe first, that labour is the "only" title to exclusive possession, and the second, that the foundation of this title lies in the right of a man to himself-that is to say to the exclusive possession of himself. What our political philosopher appears to me to mean is this A man is the exclusive possessor of himself and of the powers with which he is endowed by Natine; therefore he is the exclusive possessor of whatever is brought into existence by the exertion of those powers in the form of labour On the other hand, a man possesses, exclusively, nothing else than these powers, therefore he cannot be the exclusive possessor of anything but that which they produce Substantially as I have said, it is

the position taken up by the Physiocrats, and

night or wrong, it is, at any rate intelligible But I do not quite see how it is to be proved by any one who disputes it. The statement that a man is the exclusive possessor of himself, even in the sense of bare ownership, is most assuredly not known to be true by intuition—as, for example, the proposition that two straight lines will not enclose a space is said to be. The whole ancient Roman world would have cried out against it For them, a man's children, grown up or not, no less than his slaves, were so to from being exclusive possessors of themselves that their tather could dispose of them as he thought fit. Nor, as far as I know, is there any part of the modern world in which a legal 'infint" has the fall ownership of himself and the absolute right to the usufruct of his own powers. Again, to the best of my knowledge, there is no country or nation in which an adult man has or ever had, inany sense, the exclusive possession of himself. On the contrary, the state invariably lays claim to him for the discharge of various mulitary or civil offices, and to more or less of the fruits of his exertions in the shape of rates and texes for the support of the machinery of external defence and internal protection. In truth, as I have already pointed out, the very existence of society depends on the fact that every member of it tacitly admits that he is not the exclusive possessor of himself, and that he admits the claim

of the polity of which he forms a part, to act, to some extent, as his master. I do not think we need discuss, any further, propositions which as they are stated, are contradictory, and which when they are remodelled so as to escape such contradiction, fall into the no less fatal difficulty of contradicting plain facts. The axiom that a man has a right to himself, in the sense in which it is used in "Progress and Poverty," is a baseless assumption of exactly the same order as that other that all men are free and equal

However, there is no greater mistake than the hasty conclusion that opinions are worthless because they are badly argued. The principle that "the exertion of labour in production is the only title to exclusive possession " has a great deal to say for itself if we only substitute 'niay be usefully considered to be a" for "is the only" And, besides this, it will be interesting to trace out its logical consequences, even without such For we shall find our result to be alteration wonderfully different from that set forth in "Progress and Poverty." It is there declared to be irreconcilable with exclusive (or several) ownership of land. I think that it will become apparent that it authorises the several ownership of land to exactly the same extent as it does the several ownership of anything else 1

<sup>\*</sup> See the clear recognition of this fact in L'Abre Baudrau .

Premiere Introduction a la Philosophia Tronsmigur 1771, in VOL I

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Let us consider what 'Progress and Poverty' nas to say about this question

What most previous the realisation of the injustice of private property in land is the nabit of including all the things that are made the subject of owner-lap in one category, as property. The real and natural distinction is between things which are the produce of labour and things which are the gratintous off-rings of Nature, or to adopt the terms of political economy, between realth and land. These two things are messence and relations widely different, and to class them regether as property 1s to confuse all thought when we come to consider the justice, or the injustice, the right or wrong of property

The essential character of the one class of things is that they embody labour, are brought into being by human excition, then existence of non-existence their increase of diministron, depending on man. The essential character of the other class of things is that they do not embody labour, and exist irrespective of human excition and incorporate of man, they are the field or environment in which man finds himself, the storebonse from which his needs trust be supplied, the raw material upon which and the forces with which his labour alone can act—
(\* Progress and Poverty, "pp. 238—239.)

The latter kind of property is land, the former all other commodities which constitut. men's possessions, and the latter are said it will be observed, to be "brought into being by human exertion their existence or non-existence, their increase or diminution depending on man". Surely this is an assertion which, though pardonable enough as a common manner of speaking,

Dane's collection (p. 657). All bores or commodities, including land, are, in the long run, more or less tashuoued narmal products, 'presents de la nature mais ansa effets de l'art."

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becomes a glaring fallacy the moment it is regarded as a scientific statement from which the most serious practical consequences are deducible Can anything whatever in strict truth, be said to be "brought into being by human exertion"? Let us consider one of the earliest and simplest products of human industry, a flint implement Probably, its earliest condition was a natural flint nodule such as one may taid on any chalk down, counded at one end toughly sharp at the other, and thus convenient to the hand of the savage who picked it up. Now did he thus acquire any right of property in his find or not? He certainly spent no labour upon it, beyond that of taking possession. It was emphatically a gratuitous offering of Nature," just as much as the land on which it lay The existence of the non-existence of flints, their increase or dimmution nowise depends on man they exist a respectively of him, their quantity is strictly limited, and no man, by taking thought, can add a thint to those which already exist. If taking possession could give a title to the one thing, why not to the other? But suppose it did not. Let it occur to our foretather that a few knocks with another stone would chip the thin end of his flint to a sharper edge and make it a handler tool or weapon. Let him give those half-dozen blows, then, torsooth it 'embodies labour" and may be said to have been brought into being by human excition' By the sacramental operation of these half-dozen taps, that which previously was the common property of all men has now become several property vested "by natural law absolutely in one man.

With the gradual improvement of the art of flut chipping, the implement advanced from the rough, hardly modified, natural nodule to the exquisitely symmetrical and delicate axe, or spear, or arrow head, of a subsequent epoch, or to the still more finished ground axes of yet later date The quantity of labour invested in each unplement, therefore, steadily increased, as time went on, in proportion to the quantity of the raw flint But the latter was always there. The assertion that the most perfected and artificial of these implements is "brought into being by human exertion,' becomes a gross error if it leads us to forget that, without the peculiar physical properties of the flint which are emphatically "the graturtous offering of nature," any amount of human exertion would be thrown away

What is true in this extremely simple case, is true of everything which is said to be produced by human industry. In all such things there is something—a buildle of natural qualities and powers which exists irrespective of human exertion—and something, a shaping and modification of the buildle, which is the effect of human exertion. It is only the relative proportion of the

two which varies I. A man who hurls a stone loads it with a dose of labour which evaporates when the missile strikes its object, and the stone returns to its previous condition of a mere offering of Nature. A man who slices the same stone and cuts a cameo out of the slice, permanently incorporates an enormous amount of labour with it.

In the one case the 'gratuitous offering' is at a maximum, in the other at a minimum, but the foundation in each case is a gift of Nature.

"Progress and Poverty" sets before us the case of a steel pen with much elaboration (p 236). But the author fails to notice the patent fact that the non ore, the existence of which is the conditio sine quid non of that of the pen is a gratuitous offering of Nature. The well-known case of the chronometer-balance-wheel spring would have still better exemplified the maximum incorporation of labour with the immimum of 'the gratuitous offering"

Now is there any real difference between land and other things in this respect? In Upper Egypt, I have stood with one foot on soil bearing a rich green crop, and the other on the stony desert, as barren as a brick floor, which extended for hundreds of miles to the westward without supporting so much as a blade of grass. The green crop, in fact, reached exactly as far as the

<sup>1</sup> I have long since argued all this out in my introductory Primer of Source

muddy water of the Nile had been carried by the labour of the migator. Surely, in this case, the cultivable land 'embodied labour' and had no more existence independently of human exertion than the pen of the watch spring

In the state of nature, I doubt if ten square miles of the surface of the chalk downs of Sussex would yield pickings chough to keep one savage for a year. But, thanks to the human labour bestowed upon it, the same area actually yields, one way or another, to the agriculturist the means of supporting many men. If labour is the foundation of the claim to several ownership, on what pretext can the land, in this case also, be put upon a different focting from the steel pen? The same argument holds good for even the nehest soil in the west of North America or in the south of Russia. In the natural state of such land, the savage hunter needs access to a vast area in order to make even a precarious hyelihood. The labour spent upon it is an important factor in bringing about its rich barvests

If we keep these simple and obvious truths in mind, the value of the following argument will be readily appraised —

The right to exclusive ownership of anything of human pioduction is clear. No matter how many the hands through which it has passed, there was at the beginning of the line, human labour—some one who, having produced or produced it by his exertions, had to it a clear title as against all the rest of

mankind, and which could justly pass from one to another by sale or git 1

Suppose however, that we let this go and proceed to the next sentence —

But at the end of what string of conveyances or grants can be shown or supposed a like title to any part of the material universe?

Well, but surely all "human productions," from the roughest flint implement to the most exquisite chronometer, are parts of the material universe"? We have seen that man cannot make flints; nor can be make the non, or gold or sodium, or silicon which enters into the structure of the watch or the pen. His most consummate art is but a moving into certain places of the parts of the material universe with which Nature supplies him at least as gratuitously as she supplies land.

What then becomes of the uext part of the argument?

To improvements such an original title can be shown, but it is a title only to the improvements and not to the land itself. If I clear a forest, drain a swamp, or fill a morass all I can justly claim is the value given by these exertions. They give me no right to the land itself, no claim other than to my equal share with every other member of the community in the value which is added to it by the growth of the community.

By a parity of reasoning, it would seem that I might say to a chronometer maker. 'The gold and the iron of this timepiece, and, in fact, all the

<sup>1</sup> P agrees and Parrity, p. 242

substances out of which it is constructed, are parts of the material universe, therefore the property of mankind at large. It is very true that your skill and labour have made a wonderful piece of mechanism out of them, but these are only improvements. Now you are quite entitled to claim the improvements, but you have no right to the gold and the iron—these belong to mankind."

The watchmaker might reasonably think the task set before him as difficult as that imposed upon Shylock, when he was told that he was entitled to have his pound of flesh but that he must shed no blood in the cutting it out. He might urge that for all practical purposes the "improvements" are the chronometer, while the gratintous offering of Nature in the shape of raw material is relatively insignificant. To the ordinary mind there seems to be a great deal of sanity in this contention, not so to our political philosopher

But it will be said "There are improvements which in time become indistinguishable from the land itself!" Very well then the title to the improvements becomes blended with the title to the land—the individual right is lost in the common right. It is the greater that swallows up the less, not the less that swallows up the greater. Nature does not proceed from man, but man from Nature and it is note the boson of Nature that he and all his works must return again. (p. 243.)

What answer is appropriate to such stuff as this but Mr Burchell's famous, if unpolite, monosyllable 'Fudge'?

It is one of the special characteristics of the  $\dot{a}$ priori school to assume the exact truth of any currently received proposition which is convenient for the business of deductive brain-spinning But every one who is conversant with things, and not merely with what is more or less properly said about things is aware that most widely received propositions, even in many branches of physical science, may be only approximately true, and that if a chain of deductions of unusual weight is to be suspended from any of them, it is highly needful to examine it afresh, in order to see whether it will bear the stram-whether, in fact. it is accurate enough for the new purpose to which it is to be put. For ordinary purposes, a foot rule is an accurate measure, but it does not follow that it will suffice for ascertaining the exact length of the base line of a trigonometrical survey

In this very case of the ownership of land, Mr George essentially agrees with the Physiocrats who declared agriculture to be the only really productive industry, because land alone produces the food-stuffs by which men maintain their existence. In a rough and ready sense this is true, and it would be pedantic to object to it. But when such a statement is taken as the peg on which to hang deductions which end in grave practical consequences, it is needful to re-examine it thoroughly. And an elementary knowledge of the realities of the case enables one to see that, in

any but a popular sense, the proposition is untrue In a strictly scientific sense, the soil is no more a producer than air and water and sunshine are, indeed, is altogether less important than they as a condition of production For food-plants, which are the producers and the only producers of foodstuffs properly so called, could not possibly get on without air, water, and sunshine, though they might do without soil. It would be possible to grow a crop of tood-plants no part of which had ever been in contact with the soil. On the other hand, the richest of soils may be as barren as the desert in regard to economic production—for the simple reason that it is occupied by a luxuriant growth of plants that are not producers of foodstuffs adapted to human needs

The "gratuitous offering of Nature" in the shape of a hundred across of tropical forest would be of not much more use to a savage than the like area of a gorse common

We have all this time been occupied with the eleven pages—not very large pages either—which make up the first chapter of the seventh book of "Progress and Poverty"—but there are more fallacies than pages, and I have not yet done with them—Indeed, like a careful entertainer, I have saved some of the best for the last—Here is a very fine one—

The Almighty who cierted the earth for min and min for

the earth, has entailed it upon all the generations of the children of men by a decree written upon the constitution of things—a decree which no human action can bar and no prescription determine (p. 240)

One would think that the utterer of these 'prave 'ords' had been the conveyancer who effected the entail of which he speaks thus confidently. Big-sounding but empty phrases may be the making of a stump-orator, but what is to be said of them in the mouth of a professed thinker? And what is the practical outcome of this tall talk?

Though his titles have been acquesced in by generation after generation, to the landed estates of the Duke of Westmanster the poorest child that is born in London to-day has as much light as his eldest son. Though the sovereign people of the State of New York consent to the landed possessions of the Astors, the puniest infant that comes wailing into the world in the squalidest room of the most miserable tenement house, becomes at that moment seried of an equal right with the millionaires. And it is nobbed if the right is denied. (p. 240.)

Landowners can make no just claim to compensation if society choose to resume its right ("Progress and Poverty, Preface, p vu.)

Who would not be proud to be able to orate in this fashion? Whose heart would not beat high at the tempest of cheers which would follow stirring words like these addressed to needy and ignorant men? How should the impassioned speaker's ear be able to catch a tone as of the howl of hungry wolves among the cheers? Why

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should be rare that his sturing words might sturn the plain enough conclusion. Well, if these things are all ours as much as thems, and we are the stronger, why do we not take our own, and that at once? What harm in robbing robbers?

Well, whether exhortations in this style are legitimate of not, this much is certain—that, as I hinted before, it is desirable to make very sure of your ground before proceeding to such extremities. Many years ago I heard of an Englishman who had gone to see the Coliseum at Rome by mom-He had been warned that the place was haunted by thieves, and was on the alert. Sure enough, a man brushed hastily past him; and the Englishman, looking back, saw a watch in his hand Without more ado, our countryman, being a prompt soit of person, knocks the tellow down, captures the watch and makes off to his hotel. lest there should be accomplices about. And, lo' when he is safe in his room he finds he has two watches

I am disposed to think that the communities who follow out Mr. George's suggestions will find themselves, on Mr George's own principles, in the position of our too ready-fisted Briton. For according to Mr George, that deed of entail which he should have somewhere in a tin box in his office, confers the land upon "all the generations of the children of men". Hence it follows that the London infant has no more title to the Duke.

of Westminster's land, and the New York haby no more to Messrs. Astor's land, than the child of a North American squaw, of a native Australian, or of a Hottentot. Property of the community, forsooth' What right has any community, from a village to a nation, to several property in land more than an individual man has?

Natural justice can recognise no right in our [body of men] to the possession and enjoyment of land that is not equally the right of all [their] fellows (p. 240)

Does it make any difference to the validity of this proposition if I substitute the words in italies for the actual words "man" and "his." So the splendid prospect held out to the poor and needy is a mere rhetorical minage, and they have been cheated out of their cheers by mere "bunkum." Consider the effect of a sober and truthful statement of what the orating person really meant or according to his own principles, ought to mean, say of such a speech as this.—

My free and equal tellow country men, there is not the shiphtest doubt that not only the Duke of Westiams to and the Messra Astor, but every body who holds land from the area of a thousand square node, to that of a table cloth, and who, against all equity, denies that every pauper child has an equal right to it is a Robber (Lond and long-continued cheers, the animum, especially the paupers, standing up and wring hits). But, my friends, I am also bound to tell you that neither the pauper child nor Mesra Astor, nor the Duke of Westminster, have any more light to the land than the first negar you may meet, or the Esquincian at the north of this great continent, or

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the Puegans at the south end of it. Therefore before you proceed to use your strength in claiming your rights and take the land away from these usurping Duties and robbing Astors, you must recollect that you will have to go shares in the preclace of the operation with the four hundred and out milhous of Chinamen the hundred and fifty millions who inhabit Hindostan, the—(loud and long-continued hisses the audience, especially the paupers, standing up and projering handy movables at the orator)

## IX

## GOVERNMENT ANARCHY OR REGIMENTATION

## [1890]

As a problem of political philosophy, Government presents three principal aspects. We may ask in whom is the sovereign authority vested? Or by what machinery should that authority be exercised? Or in respect of what matters is its exercise legitimate?

The first two of these questions have been discussed by philosophers and fought over by factions from the carbest times. Imminerable battles have been waged about the rival claims of kings, nobles and popular leaders to the "right divine to govern wrong," and for or against, the excellence of this or that legislative and administrative apparatus. The third question, on the other hand, has come to the front only in comparatively recent times. But its importance has increased and is increasing rapidly, indeed, at present, it completely over-



shadows the others—The great problem of modern political philosophy is to determine the province of government. Is there, or is there not, any tegion of human action over which the individual himself alone has jurisdiction and into which other men have no business to intrude <sup>2</sup>

In the ancient politics of Greece and Rome hardly any part of hunan life, except a man's family religious practices, was thus sacred from the intrusion of the State Beyond the limits of this primary social group even religious liberty ceased The aucient States permitted no acts which manifested want of respect, still less such as savoured of active opposition to the cults authorised by the community Any "infidels" who ventured to give open expression to their lack of faith in the gods of the city were quickly taught that they had better keep then opinions to themselves, and no mercy was shown to those foreign religious the practices of which were judged to be inconsistent with the public welfare But the old pagan religious had no propaganda and as persecution is usually a correlate of proselytism, they were fairly tolerant in practice, until the progress of Christianity opened the eyes of the Roman authorities to the fact that civil existence, as they understood it, was incompatible with religious existence, as the Christians understood it Pagun Rome, therefore, systematically persecuted Christianity with the intention of averting a political catastrophe of the gravest character. The Christian Church was the "International" of the emperors of the second and third centuries.

It is commonly supposed that the result of the intermittent, if internecine warfare thus waged was the victory of the Church, and that, in the words of Julian, the Galilean conquered. But those who compare the Christianity of Paul with that of Constantine's prelates may be permitted to doubt whether, as in so many other cases, the vanguished did not in effect subdue the victor, whether there is not much more of Greek philosoply and of Roman organisation and ritual, than of primitive Christianity, in the triumphant Catholicism of the fourth and later centuries One heritage of old Roman statecraft, at any rate. passed bodily over to Catholic churchcraft soon as the church was strong enough, it began to persecute with a vigous and consistency which the Empire never attained In the ages of faith, Christian ecclesiasticism raged against freedom of thought as such, and compelled the State to punish religious dissidence as a criminal offence of the worst description. The ingenuity of pagan persecutors failed to reach the shaneful level of that of the Christian inventors of the Holy Office; nor did the civil governors of pagan antiquity ever degrade themselves so far as to play the executioner for a camarilla of priests. The doctrine that the authority of the State extends to men's

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beliefs as well as to their actions, and, consequently. is conterminous with the whole of human life. and that the power of the State ought to be used for the promotion of orthodoxy and the extermination of heterodoxy is, in fact, a necessary corollary of Romanism, which however disguised by prudence when the Papacy is weak is sure to reappear when it is strong enough to dispense with hypocrisy In the sixteenth century, the theory and practice of a thousand years had so thoroughly incorporated intolerance with Christianity, that even the great reformers held firmly by this precious heirloom of the ages of faith, whatever other shards of ecclesastical con uption they might cast aside Happily, the pretensions to infallibility of sects, who differed only in the higher or lower positions of the points at which they held on to the slope between Romanism and Rationalism, were so absurd, that political Gallios have been able to establish a modus viiendi among them In this country, at any rate, the State is approaching, if it has not quite reached, a position of non-intervention (inclining perhaps to malevolent neutrility) in theological quarrels

The prolonged intellectual and physical struggles which have thus tended to the more and more complete exclusion of a great group of human interests and activities from the legitimate sphere of governmental interference, have exerted a powerful influence on the general theory of

Government Two centuries have clapsed since this influence, having for some time made itself felt among political philosophers, prompted that systematic inquiry into the proper limits of governmental action in general, which is contained in John Locke's two "Treatises on Government" published in 1689

The Revolution of 1688 marks one of the acute stages of that contest between Liberalism and Absolutism in these islands which began to manitest itself in a remote period of our history. Liberalism, represented by Parliamentary politicians and Protestant theologians had prevailed over Absolutism, represented by the Stuarts in the political sphere, and by Papistry, open or disguised, in that of religion The two "Treatises" form an apology for the victors. A theoretical justification for the accomplished fact was much needed, and Locke would have been unworthy of his reputation as a speculative philosopher, if he had failed to discover, or to invent, a theory sufficiently plausible to satisfy those who desired nothing better than to be persuaded of the justice of acts, by which, in any case, they meant to stand The first casay is ostensibly directed at poor dead · and gone Sir Robert Filmer, with his Adamic mythology (which, by the way, Locke treats as if it were serious history), but the controversial shots are intended to pass through their ostensible object and to slay the defenders of disme night,



who lay behind the Filmerian outpost. In the second essay, On Civil Government," which alone has any interest to us at the present day, the theory of State omnipotence propounded by Hobbes (and supposed, though wrongfully, to have been invented in the interests of monarchy) is vigorously assaulted.

Hobbes was a thinker and writer of marvellous power, and, take him altogether, is probably the greatest of English philosophers, but it was given to him, as little as to Locke to escape from entanglement in the à priori speculations which had come down mainly from the Roman jurists. Setting out from the assumption of the

<sup>&</sup>lt;sup>1</sup> Hobbes's conception of the State may be sufficiently gathered from the following passages extracted from the Philosophical Rudoments concerning Government and Society (1651) men, therefore among themselves are by nature equal, the mequality we now discern both its spaces to the (chap 1 3) "Nature hath given to every one a night to all The natural state of men before they entered into a war of all men against all men" (ibid 12) society was In whatever man or body of men dominion or governmental authority is vested "each citizen has convoyed all his strength and power to that man or council (chap v 11) The supreme power is absolute (chap vi 13), and comparable to the soul of the city as its will (ibid 19) "The will of every citizen is in all things comprehended in the will of the city, and the city is not fied to the civil laws, and the will of the depository of dominion is the will of the city (chap vi 14) Judging of good and cyal does not belong to private citizens (chap xii 1) nor do they possess any rights or liberties execut such as the sovereign grants All power, temporal and spiritual is united (under Christ) in the sovereign authority of a Christian city, and absolute obedience is due to it. When the sovereign is not Christian, and his commands are contrary to those of the Church, the subject must disobeying but not resisting, ' go to Christ by martyrdom" (chap xviii 13)

natural equality of men, and of a primary "state of nature" in which every man strove for the full exercise of his "natural rights," and which was therefore, a state of war of each against all, Hobbes further assumed that, in order to obtain the blessings of peace, men entered into a contract with one another, by which each suirendered the whole of his natural rights to the person or persons appointed, by common consent, to exercise supreme dominion, or sovereignty, over each and all of the members of the commonwealth constituted by the contract The authority of the sovereign (whether one man or many, monarch or people 1) to whom this complete surrender of natural rights was made, was thus absolute and unquestionable From the time of the surrender, the individual member of the Commonwealththe citizen-possessed no natural rights at all, but, in exchange for them be acquired such civil rights as the sovereign despot thought fit to grant and to quarantee by the exercise of the whole power of the State, if necessary Civil law, sanctioned by the force of the community, took the place of "natural right," backed only by the force of the individual It tollows that no limit is, or can be, theoretically set to State interference The citizen of the "Leviathan 'is simply a member of a composite organism controlled by the State will; he has no more freedom in religious matters

1 See Philosophical Rudiments chapters vi and vii

than in any others, but is to perform the practices of the State religion, and to profess the creed of its theology, whether he likes the one and believes the other, or not. The ideal of the State is a sternly disciplined regiment, in which the citizens are privates, the State functionaries officers, and every action in life is regulated and settled by the sovereign's 'Regulations and Instructions' Disobedience is worse than mutury. For those who disobey need not even be tried by courtinaltial. By the very act of insubordination they revoke the social contract, and, falling back into the state of nature—that is to say, of the war of each against all—they become aliens, who may be dealt with, summarily, as enemies

Thus, there are three fundamental points in Hobbes's theory of a polity. First, the primitive state of nature, conceived as a state of war, or unrestricted struggle for existence among men Second, the contract, by the execution of which men entered into commonwealths or polities. Third the complete surrender of all natural rights to the sovereign, and the conferring of absolute and despotic authority upon him, or them, by that contract

Now, Locke also assumes a primitive state of nature, though its characters are different; he also assumes the contractual origin of the polity, and thus, on these two points, is in general agreement with Hobbes. But with respect to the third

article, he diametrically opposes Hobbes, and declares that the surrender of natural rights which took place when the social compact was made was not complete, but, on the contrary, most strictly and carefully limited

The difference is of great importance. It marks the point of separation of two schools of d priori political philosophy, which have continued to be represented, with constantly increasing divergence, down to the present time, when the ultimate stages of their respective series confront one another as Anarchy on the one hand, and Regimentation on the other

But it is necessary to define these epithets with care, before going further. Anarchy, as a term of political philosophy, must be taken only in its proper sense, which has nothing to do with disorder or with crime, but denotes a state of society, in which the rule of each individual by himself is the only government the legitimacy of which is recognised. In this sense, strict anarchy may be the highest conceivable grade of perfection of social existence, for, if all men spontaneously did justice and loved mercy, it is plain that all swords might be advantageously turned into ploughshares, and that the occupation of judges and police would be gone. Anarchy, as

<sup>1 &</sup>quot;For if men could rule themselves, every man by his own command, that is to say, could they live according to the laws of nature, there would be no need at all of a city, nor of a

thus defined, is the logical outcome of that form of political theory, which for the lest half-century and more has been known under the name of Individualism.<sup>1</sup>

I have, unfortunately, no such long established prescription to offer for the term Regimentation, but I hope it will be accepted until some one discovers a better denomination for the opposite view, the essence of which is the doctrine of State omnipotence. "Socialism," which at first suggests itself, is unfortunately susceptible of being used in widely different senses. As a general rule, no doubt, socialistic political philosophy is eminently regimental But there is no necessary connection between socialism and regimentation who, of then own free will should think fit to imitate the primitive Christians depicted by the Acts, and to have all things in common, would be Socialists and yet they might be none the less Individualists, so long as they refused to compel any one to join them. The only true contradictory of Individualism is that more common kind of

common coercive power'—Hobbes, Philosophical Elements, chap vi 13, note

It is employed as an already familiar appellative by Louis Plane in the first volume of his Historie de la Recolution Francoise, published in 1947 which contains a very interesting attempt to frace the influence of the principles of authority, of individualism and of fraterinty, through French history. The first volume of the elaborate work of Marlo (Winkelblech), Organization as indeed, published in 1850 gives a telly complete exposition of the theory of Individualism under the name of Liberalismus.

Socialism which proposes to use the power of the State in order, as the phrase goes, to 'organise' society, or some part of it. That is to say, this "regimental" Socialism proposes to interfere with the freedom of the individual to whatever extent the sovereign may dictate, for the purpose of more or less completely neutralising the effects of the innate inequalities of men. It is militarism in a new shape, requiring the implicit obedience of the individual to a governmental commander-in-chief, whose business is to wage war against natural inequality, and to set artificial equality in its place.

I propose now to give an outline of the progress, first of Regimentation and then of Individualism since the seventeenth century

In France Regimentation was strongly advocated by Morelly and by Mably before Rousseau's essay on the Social Contract made its appearance, and, to my mind except in point of literary form, the works of the ormer two writers are much better worth reading. But, while the immense popularity of Rousseau made him the apparent leader of the movement in favour of social regimentation, the comparative vagueness of his demands for equality commended him to practical politicians. His works became the gospel of the political—one might almost say the religious—sect of which Robespierre and St. Just



were the chiefs, 1 and the famous conspiracy of their would-be continuator, Babeut, was an attempt to bring about the millennium of eighteenth century socialism by sangunary violence

According to Rousseau, the social contract is "the foundation of all rights" (chap ix) though the sovereign is not bound by it (chap vii), masmuch as he can enter into no contract with himself This sovereign is the totality of the citizens Each, in assenting to the social contract, gives himself and all he possesses to the sovereign (v1), ' lui et toutes ses forces dont les biens qu'il possède font partie" (chap ix) He loses his natural liberty, and the State becomes master of him and of his goods (chap. ix) As nature gives a man absolute power over all his members, the social compact gives the polity an absolute power over its citizens. The State, however, does not really despoil him He gets back civil liberty (that is, such amount of liberty as the State

As Mi Lecky justly says. "That which distinguishes the French Revolution from other political movements is, that it was directed by men who had adopted certain speculative a priori conceptions of political right, with the fanctions and procely using fervour of a religious belief, and the Bible of their creed was the Control Second of Rousseau" (History of England in the Eighteenth Ucntion, vol. v. p. 345). I have not undertaken a criticism of Rousseau's various and not undertaken the control opinions, as a whole. It was not needful for my purpose to do so, and, if it had been, I could not have improved upon the comprehensive and impartial judgment of our historian of the eighteenth century.

decrees) and a right of property in that which he possesses (chap. viii). His pierious possession, which was bare usurpation, is thus changed into right. In this way members of the community become mere depositaries of the public property, the private right of ownership being subordinate to the supreme right of the community (chap. ix ) The general will is the source of authority, whoever refuses to obey its behests is to be coerced into obedience by the whole body-'which means nothing more than that he shall be forced to be free' (chap vii) As will be seen on turning to the extracts from the "Philosophical Rudiments" given above (p. 388, now) most of this is Hobbism pure and simple The fundamental principle of the Rousseauite, as of the Hobbist, polity is the omnipotence of the State; its boasted liberty is a grant from the sovereign despot, whose absolutism is sugared over by the suggestion that each man has an infinitesimal share in it if any one of the sovereign people should be as blind to the benefits of this sort of free bondsmanship and coerced brotherly love as "Needy knifegrinder" was, his incivism" is to be cured by physical treatment. "On le forcera d'être libre"

The despotism of the "general will" (volonte générale) being thus established, how is the sovereign to make his commands known? This is a point about which it is sarely necessary to be very

clear. Unfortunately, Rousseau leaves at not a little obscure. He commences the second chapter of his second book by declaring that the general will is that of the body of the people, that, as such the declaration of it is an act of sovereignty, while the declaration of the will of a part of the people is merely an act of administration. Yer, in a note, we are told that for the "will" to be "general" it need not be unanimous, only all the votes must be taken. How the expression of will which is not unanimous can be other than that of a part of the people, does not appear But full light is thrown upon Rousseau's real meaning in the second chapter of the fourth book. Following Locke's dictum that nothing can make a man a member of a commonwealth 'but his actually entering into it by positive engagement and express promise and compact " (" Civil Government," § 122) he tells us that

the only law which, by its nature, requires mainimous assent, is the social compact—for civil association is the most voluntary of all acts—every man being born fire and master of himself, no one, under any pretext whitever, can subject himself without avoid of the act

Those who do not assent when the social contract is made remain strangers among the citizens, but after the State is constituted, residence within its bounds is to be taken as assent to the contract.

Outside this primitive contract the vote of the majority onlight the test, that is a consequence of the contract itself

In the Rouseaute State, then sovereignty agens neither more nor less than the omnipotence of a base majority of voices of all the members of the State collected together in general meetings (chaps an -xiv)

During the sittings of this sovereign multitude which are to take place at fixed intervals,

the junishment of the government coases the executive power is suspended, and the prison of the londrest citizen is as exceed and inviolable as that of the highest magnificate, for where the represent d is present the representative coases to exist.

In fact, in each of those periodical meetings, the polity potentially returns to the state of nature and its members, if they please, may dissolve the social contract altogether if they do not so please, they reappoint office-bearers to do the nork assigned to them, whatever that may be (in chap xvii) until the next assembly. Society is thus a sort of joint-stock company whose officers vacate their posts at every general meeting, and whose shareholders can wind up the concern, or go on, as the assembly may resolve, with such articles of association as a bare majority of the shareholders may determine shall be binding until the next meeting. An industrial company organised in this way would probably soon resign sove-

reignty to a liquidator. But then the members of industrial associations certainly do not undergo that transfiguration which, according to Rousseau, is worked by entrance into the social contract "The general will," says he, "is always upright and always tends towards the general good" (liv ii. chap iii), "the people are never corrupted" (ibid), "all constantly desire the happiness of each" (liv ii chap iv).

Unfortunately, the intellect and the information of the sovereign are not always quite up to the standard of his morality —

The general will is always just, but the judgment which guides it is not always enlightened (liv in chap vi)

It would seem that flattery of the sovereign is not peculiar to monarchies. Notoriously, kings can do no wrong, and always spend their lives in sighing for the welfare of their subjects. If they seem to en, it is only because they are misled and misinformed. That has been the great makebelieve of apologists for despotism from all time.

A properly enlightened sovereign people, with its incorruptible altruism, can never lose sight of the true end of legislation, the greatest good of all, and if we seek to know what that is, Rousseau tells us that it embraces two things, Liberty and Equality (liv. ii. chap xi) Liberty, he says, is "obedience to the law which one has laid down for oneself" (liv i chap viii.), a well-sounding

But to my mind it is somewhat haid definition to reconcile with the obligation to submit to laws laid down by other people who happen to be in a majority Unless, indeed, this "law which one has laid down for oneself" simply inculcates obedience to the inaposity But, if that be liberty, then liberty is no less possessed by the man who makes it a law to hunself to obey any master; and liberty is as fully possessed by the slave who makes up his mind to be a slave, as by the freest of tree men

With respect to the other aim of government, the maintenance of equality, Rousseau makes an instructive statement in answering the objection that the attempt is chimerical

It is precisely because the nature of things (joice des choses) continually tends to the destruction of equality, that the power of legislation ought always to tend to maintain it 1

In spite of all his soutimentatism Rousseau occasionally sees smalght into the realities of things. A prendre la termo dans la requeur de l'acception, il n'il jamois è este de les dable

denocratio, et il n'en custena januars. Il est control d'ordre naturel que le grand nombre gouverne, et que le petit soit gouverne.

Sil y anost un peuple d'odicie et l'e gouverne aut democratiquement. Un gouvernement si parfait no convent pas à des homm i (liv in chap iv). "A second Damel come to judgment!" Foi it would not be ter from the truth to say that the only form of government which has ever permanently existed is ringarian A very strong despot of a futious multitude may, for a brief space work their single of collective will but the power of an absolute monarch is as a rule, as much in the hands of a ring of ministers, misticsses, and priests, as that of Demos in reality, wielded by a ring of orators and wire-pullers As Hobber has pathely put the ear, "A democracy in effect is no more than an anistocracy of orators, interrupted sometimes with

Absolute equality of power and wealth is not required, but neither opulence nor beggary is to be permitted, and it is to depend upon the legislators' view of the circumstances whether the community shall devote itself to agriculture or to manufactures and commerce (liv ii chap ai). Thus the State is to control distribution no less than production. Moreover, the sovereign people is to settle the articles of a State religion, not exactly as religious dogmas, but as "sentiments of sociability without which a man can neither be a good citizen nor a faithful subject."—

Without being able to oblige any one to believe them, he may banish from the State whoever does not believe them, he may banish them, not for imputy but for unsociability—as persons meapable of succeedy loving the laws or justice, and of sacrificing themselves to duty if needful. It any one after having acknowledged these sume dogmas, conducts himself as if he did not believe them, let him be punished with death. It has committed the accatest of crimes he has hed before the law (liv iv chap viii)

The articles of the State creed are—the existence of a powerful, intelligent, beneficent, forcseeing and provident Deity, the life to come the happiness of the just the punishment of the

the temporary monuchy of one or ito? (De Corpore Politice, chap in 5) The alternative of dominion does not be between a sovereign individual and a sovereign multitude, but between an aristarchy and a democratic obgarchy. The chief business of the aristarchy is to persuade the king emperor, or can, that he wants to go the way they wish him to go; that of the demarchy is to do the like with the mob

wicked, the sunctity of the social contract and of These are the positive doctrines of the Rousseaute creed. Of negative dogmas there is only one, and the reader may be surprised to learn that it enjoins the repression of intolerance Having banished unbelievers in the State creed and put to death lapsed believers, Rousseau thanks God that he is not as those publicans the devotees of "les cultes que nous avons exclus' —intoleiant Does he not proclaim that all religions which toleratc others should themselves be tolerated? Yet the qualificatory provision, "so far as their dogmas are in no way contrary to the duties of the citizen." would seem to effect a considerable reduction in the State toleration of the tolerators, since, as we have just seen, it is obligatory on the citizen to profess the State creed

Whether Rousseau used the works of Morelly and of Mably, as he did those of Hobbes and Locke, and whether his reputation for political originality is not of that cheap and easy soft which is won by sedulously ignoring those who have been unmannerly enough to anticipate us, need not be discussed. At any rate important works of both these authors, in which the principles to be found in the essay on the "Social Contract" are made the foundation of complete schemes of regimental socialism with community of goods, were published earlier than that essay. Robespierre and St. Just went as far as Rousseau in the direction of enforc-

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ing equality, but they left it to Babœuf to try to go as far as Mably In their methods of endeavouring (by the help of the guillotine) to "force men to be fice," they supplied the works naturally brought forth by the Rousseauite faith. And still more were they obedient to the master in insisting on a State religion, and in certaining the existence of God by a governmental decice.

The regimental Socialists of our own time appear to believe that, in their hands, political regimentation has taken a new departure, and substantially differs from that of the older apostles of then creed Certainly they diverge from the views of Owen or of Fourier, but I can find nothing of importance in the serious writings of the modern school, nor even in their romances, which may not be discovered in the works of Morelly and of Mably whose advocacy of the doctrines that several ownership is the root of all the evils of society, that the golden age would return if only the State directed production and regulated consumption, and that the love of upprobation affords a stimulus to industry, sufficient to replace all those furnished by the love of power, of wealth and of sensual gratification, in our piesent imperfect state, is as powerful as that of any later writers.

We may now turn to the other line of development of political philosophy based upon a priori

arguments, which is represented by individualism m various shades of intensity. I have already said that the founder and father of political individualism, as it is held by its more moderate adherents at the present day, is John Locke, and that his primary assumptions—the state of nature and the contractual basis of society—are the same as those of his predecessor Hobbes, and of his successors Rousseau and Mably. But I have also remarked that the condition of men in the state of nature, imagined by Locke, is different from that assumed by either Hobbes or Rousseau. For these last philosophers, primitive man was a savage, lawless and tenocious according to the older, good and stupid, according to the younger, theorist. Locke's fancy picture of primitive men, on the other hand represents them under the guise of highly intelligent and respectable persons 'living together according to reason without a common superior on earth, with authority to judge between them " (" Civil Government," § 19)

The Law of Nature 1 is, in fact, the law dictated by reason, which 'teaches all mankind who will but consult it, that, being all equal and independent, no one ought to harm another in his life

<sup>&</sup>lt;sup>1</sup> This view of the law of nature comes from the jurist. Hobbes defines it in the same way, but he says that, in the state of nature, the Law of Nature is silent. In speaking of Locke as the founder and father of Individualism, I do not forget that Hooker (to whom Locke often refers), and still earlier writers, have expressed individualistic opinions. Nevertheless, I believe that modern individualism is essentially Locke's work.

hberty, or possessions" Elsewhere (§ 4), the state of nature is defined as a state of "perfect freedom," in which men dispose of their possessions and persons as they think fit", and further as a state of equality,

wherem all the power and jurisdiction is reciprocal, no one having more than another, there being nothing more evident than that creatures of the same species and rink, promiseuously born to all the same advantages of nature, and the use of the same faculties, should also be equal one among t another without subordination or subjection

Again (§ 7), since the law of nature "willeth the peace and preservation of all mankind," every man has a 'right to punish the transgressors of

1 Yet Locke, of course, knows well enough that children are not born equal and that adults are extremely unequal. All that he really means is that men have an 'equal right to natural freedom' and that is a more a priore du tum (\$ 34-87) sceptics as to the reality of the state of nature are treated with some contempt (§ 14) It is often asked and weighty objection Where are or ever were there, any such men in a state of nature? To which it may suffice as an answer at present, that since all pring as and rulers of undependent governments, all through the world are in a state of nature, it is plain that the world never was, or ever will be, without numbers of men in that state I have named all governors of independent communities, whether they are or me not in league with others, for it is not overy compact that puts an end to the state of nature between men, but only this one of agreeing together mutually to enter into one community and make one body politic, other promises and compacts men may make with one another, and yet still be in the state of nature. The promuses and barguns for truck &c., between the two men in the descrit island mentioned by Garci lasso de la Vega, in his History of Peru, or between a Swiss and an Indian, in the woods of America are binding to them though they are perfectly in a state of mature, in reference to one another for truth and keeping of faith belongs to men as men and not as members of secrety

that law '; that is to say, those who invade the rights of others. Moreover, truth and the keeping of faith are commands of the Law of Nature, and belong "to men as men," and not as members of society (§ 14). Locke uses the term Law of Nature, therefore, in the sense in which it was often (perhaps generally) employed by the jurists, to denote a system of equity based on purely rational considerations.

There is no connection between this law of nature and 'natural rights," properly so called The state of nature imagined by Locke is, in fact, the individualistic golden age of philosophical anarchy m which all men voluntarily rendering summ curque, there is no need of any agency for the enforcement of justice While Hobbes supposes that, in the state of nature, the Law of Nature was silent, Locke seems to imagine that it spoke loudly enough, but that men grew deaf to it. It was only in consequence of the failure of some of them to maintain the original standard of ethical elevation that those inconveniences arose which drove the rest to combine into commonwealths, to choose rulers, and to endow them, as delegates of all. with the sum of the right to punish transgressors inherent in each

In taking this important step, however our forefathers exhibited that caution and prudence which might be expected from persons who dwelt upon the ethical heights which they had reached

in the state of nature - Instead of making a complete surrender of all the rights and powers which they possessed in that state, to the Sovereign, and thus creating State omnipotence by the social contract, as Hobbes wrongfully declared them to have done, they gave up only just so much of them as was absolutely necessary for the purposes of an executive with strictly limited powers. With the Stuarts recognised by France and hosts of Jacobite pamphleteers on the look-out for every coign of vantage, it would never do to admit'the Hobbesian doctrine of complete surrender Locke is careful to assert that when men entered into commonwealths they must have stipulated (and, therefore, on approved d priori principles, did stipulate) that the power of the Sovereign was strictly limited to the performance of acts needful 'to secure every one's property"

\$ 181 But though men when they enter into society give up the equality liberty and executive power they had in the state of nature, into the hands of the society to be so far disposed of by the legislative, as the good of society shall require, yet it being only with an intention in every one the better to preserve lumself, his liberty and property, (for no rational creating can be supposed to change his condition with an intention to be noise), the power of the society, or legislative constituted by them can never be supposed to extend faither than the common good, but is obliged to seems every one's property by providing against those three defects above mentioned that made the state of nature so unsafe and uneary.

The following passages complete the expression of Locke's meaning Political power then I take to be angle of making

To listen to Locke, one would magine that a general meeting of men living in the state of nature having been called to consider the ' defects' of their condition, and somebody being voted to the tree (in the presumable absence of chairs), this carliest example of a constituent assembly resolved to form a governmental company, with strictly limited liability, for the purpose of defending hberty and property, and that they elected a director or body of directors, to be known as the Sovereign, for the purpose of carrying on that business and no other whatsoever. Thus we are a long way from the absolute Sovereign of Hobbes. Here is the point, in fact at which Locke diverged from the older philosopher, and at which Rousseau and Mably after profiting as much as they could by Locke's "Essay "left him and laid the theoretical foundations of regimental socialism.

The physiocrats of the eighteenth century, stringgling against the effects of that "fureur de gouverner," which one of their leaders, the elder Mirabean, called the worst malady of modern states, and which had nearly succeeded in strang-

lans with penalties of death and consequently of all less penalties, for the regulating and preserving of property and of ciaploying the force of the community in the execution of such laws and in the defence of the commonwealth from foreign many, and all this only for the public good," (§ 3). Covernment has no other end than the preservation of property" (§ 24)

The great and chief end, therefore, of men's uniting into commonwealths and putting them clives and a government is the preservation of their property" \$ 124

ling every branch of French industry and starving the French people necessarily welcomed and adopted Locke's individualistic formula Their favourite maxim of 'Laissez faire was a corollary of the application of that formula in the sphere of economy, and it was a great thing for them to be able to add to the arguments based on practical expediency, which could be properly appreciated only by those who took pains to learn something about the facts of the case, the authority of a deduction from one of those a priori truths, the just appreciation of which is supposed to come by nature to all men The axiom of absolute ethics in question has been stated in many ways It is laid down that overy man has a right to do as he pleases, so long as he does no harm to others, or that he is free to do anything he pleases so long as he does not interfere with the same freedom in others. Daire, in the introduction to his Physiociates" (p. 16), goes so far as to call the rule thus enunciated a 'law of nature.

La loi naturelle qui permet à chacan de faue tout co qui lui est avantageur sous la seule condition de ne pas nuire à autrui 1

If he oldest recorded form of the rule and that which has the most positive character, is contained in the command of the Jewish law "Thou shalt love thy neighbour as thyself," (Levitous xix 18), (neighbour facilities is tranger that dwelth with you 'i 34), which stands in the same relation to the individualistic mixim as Freterinty to Equity. The strength of Judaism 24 a social organisation has resided in its unfiniching

The physiociats accepted the dogma of human

Là on les 1015 et la pui-sance tutslaire n'assident point la propriété et la liberte, il n y a mi gouvernement ni société prontables il n'y a que domination et avarchie sous les apparences d'un gouvernement, les lois positives et la domination y protègent et assident les usuipitions des forts, et ausantissent la propriéte et la liberté des taibles?

That is to say, the applice political ethics of the individualist leave as little doubt in his mind that private property and the right to deal freely with it are essential to the protection of the weak against the strong, as the absolute political ethics

advocacy of freedom within the law, equality, before the law, and frateinity, outside the law. I am not sure that, from the purely philosophical point of view, the form in which that great Jew. Spinoza has stated the rule is not the bost. "Desire nothing for yourself which you do not desire for others," (nikil such appeters quod reliquis homenibus sum aupeant). (Ethices, in xim.)

1 Drost Naturel, chap 5



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of the regimental socialist assure him that private property and freedom of contract involve the tyranny of the strong over the weak

Through the widespicad influence of the Wealth of Nations," individualism became a potent factor in practical politics. Wherever the principles of free-trade prevailed and were followed by industrial prosperity, individualism acquired a solid fulcrum from which to move the political world. Liberalism tended to the adoption of Locke's definition of the limits of State action, and to consider persistence in letting alone as a definition of the whole duty of the statesman. But in the hands of even the most liberal governments these limits proved pretty elastic; and, however objectionable State interference might be, it was found hard to set bounds to it, if induced as well as direct interference were permissible. So long ago as the end of the eighteenth century the distinquisited scholar and statesman Wilhelm von Humboldt attempted to meet this difficulty wrote a special treatise, which remained unpublished till sixty years later, for the purpose of showing that the legitimate functions of the State

<sup>&</sup>lt;sup>1</sup> Von Humboldt's essay was unreten in 1791; but view, so little likely to be relished by the German governments of that day needed cautious enunciation, and only fragments appeared (under the auspices of Schiller) until 1852 when the frequent formed part of the posthumous edition of Von Humboldt's works. A translation, under the of The Sphere and Duties of Government, was published in 1855, by Di Clapman (then, as now, the editor of the Westmander Recurve) and became very well known in this country.

are negative, and that governments have no right to take any positive steps for the promotion of the welfare of the governed. Von Humboldt does not encumber himself with Locke's "limited contract," but starts an d priori arom of his own, namely—

That reason cannot desire for any man any other condition than that in which each maintidual not only enjoys the most absolute freedom of developing hirtself by his own energies in his perfect individuality, but in which external nature even is left unfashioned by any human agency but only receives the impress given to it by each individual by hirtself and his own free will, according to the measure of his wants and instructs, and restricted only by the limits of his powers and rights (p. 18)

From this very considerable assumption (which I must say does not appear to me to possess the quality of intuitive certainty) the conclusion is deduced that

the State is to abstain from all obscirule for the positive welfare of the citiz ins and not to proceed a step faither than is necessary for their mutual scrutify and protection against foreign enemics—for with no other object should it impose testarchous on freedom

This conclusion differs but little from that of Locke, verbally. Nevertheless in its practical application, Von Humboldt excludes not only all and every matter of religion, of morals, and of education, but the relations of the sexes, and all private actions not injurious to other citizens, from

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the interference of the State However, he permits governmental regulation of the power of testamentary devolution, and (though somewhat unwillingly) interference with acts which are not immediately huitful to one's neighbours yet the obvious tendencies of which are to damage them or to restrict their liberties

By far the best and fullest exposition known to me of the individualism which, in principle, goes no further than Locke's formula is Dunoyer's "Liberté du Travail" of which the first volume was published in 1525 and the whole work in 1845 One great ment of the author is the resolute casting aside all the d priors figments of his predecessors, and another lies in his careful and elaborate discussion of the historical growth of Individualism, which goes a long way towards the establishment of the conclusion, that advance in civilisation and restriction of the sphoic of Government interference have gone hand in hand J S Mill has referred to Dunoyer's work, but later expositors of Individualism ignore him completely, although they have produced nothing comparable to the weighty case for the restriction of the sphere of government, presented with a force which is not weakened by fanaticism, in the seventh chapter of the ninth book of Dunoyer's work

The year 1845 is further marked in the annals of Individualism by the appearance of Stimer's

The Individual and his Property 1" in which the author, going back to first principles, after a ruthless criticism of both limited Individualism and regimental Socialism, declares hunself for unlimited Individualism, that is to say, Anarchy justly points out that "natural right" is nothing but natural might Man, in the state of nature, could know of no reason why he should not freely use his powers to satisfy his desires. When men entered into society they were impelled by selfinterest. Each thought be could procure some good for homself by that proceeding, and his natural right to make the most out of the situation remained intact. The theory of an express contract, with either complete or incomplete surrender of natural rights, is on empty figurent, nor was there any understanding except perhaps that each would grasp as much as he could reasonably expect to keep. According to this development of Individualism therefore, the state of nature 14 not really put an end to by the formation of a polity, the struggle for existence is as severe as ever though its conditions are somewhat different It is a state of war, but instead of the methods of the savage, who sticks at no treachery, and revels in wanton destruction, we have those of modern warfare, with its Red Cross ambulances, fligs of truce strictly respected and externmention con-

<sup>&</sup>lt;sup>1</sup> Der Einige und sein Bigenthum, by Max Stirner I follow the account of the contents of the book given by Mover, Der Enancepationskampf des vierten Standes (Ed. 2, 1882, pp. 36—14)

ducted with all the delicate courtesies of chivalry The rules of this refined militancy are called laws. and mudence dictates respect for them because, as it is to the advantage of the majority that they should be observed, the many have agreed to fall upon any one who breaks them, and the many are stronger than the one Thus the sole sanction of law being the will of the majority, which is a mere name for a draft upon physical force, certain to be honoured in case of necessity; and "absolute political ethics" teaching us that force can confer no nights, it is plain that state-compulsion involves the citizen in slavery, as completely as if any other master were the compeller Wherever and whenever the individual man is forced to submit to any jules, except those which he himself spontaneously recognises to be worthy of observance, there liberty is absent. And thus we arrive at the position of the great apostle of anarchy Bakounine, according to whom the liberty of man consists solely in this that "he pays obedience to natural laws, because he himself admits them to be such, and not because they have been imposed upon him from without by any other will, whether divine or human, collective or individual' Hence it fellows that the "sovereign people" worshipped by the great champions of liberty and equality, when it dares to impose the ' general will" upon the individual, even if that

<sup>1</sup> Dieu et l'Etat, 1881

person be in a minority of one, is as brutal a usurper as ever exercised monarchical tyranny and, whether a man shall so much as recognise the right of another to the freedom which he himself exercises, is to be left to his private judgment. As all property is robbery, so is all government from without tyranny

In this country, where the influence of the pedantry of the Absolute is so much trainmelled by common sense and more or less experience of the difference between the natine of things and a priori assumptions. Individualism has, usually, stopped short of the conclusions of Stimer and of Bakounne, beyond which so far as I can see, the diplorit method can hardly carry its most hardened practitioner. Nevertheless, the "party of Individual Liberty" of which Mr. Auberon Herbert is the spokesman, must I think be classified as Anarchist, I though the definition of their conception of the relations of the individual to government looks, at first sight as if it meant no more than limited Individualism.

Each man and woman are to be free to uncer then faculties and then energies according to then own sense of what is right

Let me a mind the reader that I use ' minder' in its philosophical sense. Heaven forbid that I should be supposed to suggest that Mr. Herbert and his friends have the remotest connection with those too obsolute 'polytical philosophers who desire to hid the force of dynamics to that of persuasion. It would be as reconsible to connect Monarchists with rander, on the strength of the proceedings of a Philip the Second, or a Lewis the Fourteenth.

and wise, in every direction except one. They are not to use their faculties for the purpose of foreibly restraining their neighbour from the same free use of his faculties.

## And as to Governments-

They must simply defend the person and property of all persons by whomsoever they are assailed  $^{2}$ 

This, it will be observed, is the dictum of Locke and nothing more

But, in the application of the theory to practice, Mr Herbert goes a good deal further than even Humboldt or Dunoyer. He would do away with all enforced taxation and levying of duties, and trust to voluntary payments for the revenue of the State. The relations of the sexes and the disposition of property by will are to be quite free, traffic of all kinds is to be released from restrictions state inspection is to be abolished, no less than all hygienic regulations, state education goes, as a matter of course, and with it all state-aided museums, libraries, galleries of ait, parks, and pleasure grounds. In fact, the functions of government within the State are rigidly restricted to the administration of civil and criminal justice

But this is not all. Mr Herbert oversteps the bounds of limited Individualism and enters the region of Anarchy, when he says he is not quite sure that even this pittance of administrative power is strictly justifiable.

The Right and IFrony of Compulsion by the State 1885 Ibid p 33

I do not think that it is possible to find a perfect moral foundation for the authority of any Government, be it the Government of an emperor of a Republic. They are all of the nature of an usurpation, though I think, when conjuned a their certain exact limits of a justifiable usurpation.

A "justifiable usurpation 'is something which I can no more conceive than I can imagine a round square, it being the nature of usurpation,

as I imagine, to be unjustifiable. But I presume that what is meant is, that, though government has no moral authority, it is practically expedient that it should be permitted to exist, if confined within very narrow limits. Absolute ethics, in Mr Heibert's opinion, refuses to acknowledge the right of any government except the government of the individual by himself. Therefore I am unable to discern any logical boundary between

The fact that Individualism, pushed to its logical extreme, must end in philosophical anarchy, has not escaped that acute thinker and vigorous writer, Mi Donisthorpe, whose work on "Individualism" is at once piquant, learned, and thoroughgoing—qualities in which the writings of speculative philosophers do not always abound. I commend Mr. Donisthorpe's eighth chapter,

Mr. Herbert's position and that of Bakounine.

VOL. J

entitled "A Word for Anarchy," to those who

<sup>1</sup> The Right and Wrong of Compulsion by the State, 1885, p. 22 Individualism a System of Politics, 1889

desne to understand whither the Individualist principle, stripped bare of à priori fogs and formulas, and followed out to its consequences, lands its supporters

Starting from assumptions about the equality of men, then natural nights and the social contract, common to so many political philosopheis of the à miori school, we have been offered the choice of two alternative routes Taking that indicated by Hobbes, Rousseau Mably and their successors, we have found ourselves committed to the further à priori assumption that, when men entered into society, they surrendered all their natural rights, and, acknowledging the omnipotence of the general will, received back such legal and moral obligations and permissions as the Sovereign might be pleased to sanction. Absolute political ethics thus arrived, by a plausible logical process, at Regimentation; that is, a quasi-military organisation of society, for the purpose of conquering the general welfare by means of that enforced apparent equality which brings about the hugest of real inequalities.

On the other hand, when we took the path pointed out by Locke and followed by Liberalism, we made an *d priori* assumption of a diametrically opposite character. We said that men entering into the social contract reserved all their natural rights, except such as it was absolutely necessary

limited

to yield to government, in order that it should exercise its only legitimate function, the defence of the liberty and property of the individual According to this limited individualist view, the business of government (except in relation to external enemies) is negative, it is to interfere only for the purpose of preventing any one citizen from using his liberty in such a way as to interfere

with the equal liberty of another citizen. According to the regimentalist view, on the contiary, the

business of government is not only negative, but also and eminently positive. It is the duty of the State to interfere for the purpose of promoting the welfare of society (of which equality is supposed to be a necessary condition), however much such interference may restrict individual liberty. The final outcome of Regimentation is seen in those extreme forms of regimental Socialism which undertake to regulate not only production and consumption, but every detail of human life, that of Individualism is Anarchy, which abolishes collective government and trusts to the struggle for existence, modified by such ethical and intellectual considerations as may be freely recognised by the individual, for the establishment of a

Granting the memisses, I am unable to see that one of these lines of argument is any better than

social modus rivendi, in which freedom remains intact, except so far as it may be voluntarily

the other, and they are mutually destructive But suppose that, not being blinded by any à priors cataracts, we use our eyes upon these premisses—what utter shams and delusions they show themselves to be! I hope that no more need be said about natural rights and the equality of men But there is just as little foundation in fact for the social contract and either the limited, or the unlimited, devolution of rights and powers which is supposed to have been effected by it. We have sadly little definite knowledge of the manner in which polities arose, but, if anything is certain, it is that the notion of a contract, whether expressed or implied, is by no means an adequate expression of the process.

The most archaic polities of which we have any definite record are either families, or federations of families, and the most doctrinaire of political philosophers will hardly be prepared to maintain that the family polity was based upon contract between the paterfamilias and his wife and children, and arose out of the expressed desire of the latter to have their liberty and property protected by their governor, or that even any tacit understanding on that subject influenced the formation of the family group. In truth, the more primitive the condition of a polity, the less is there of a contract, either expressed or implied between its members—the more common is it to find that neither wife nor child possessed either

liberty, or property, worth speaking of The pater-familias of the Aryan stock, at any rate, could say 'L'état c'est moi " with more truth than any later monarch. So far from the preservation of liberty and property and the securing of equal rights being the chief and most conspicuous objects aimed at by the archaic polities of which we know anything, it would be a good deal nearer the truth to say that they were federated absolute monarchies, the chief purpose of which was the maintenance of an established Church for the worship of the family ancestors

Philosophers proud of living according to reason, are too apt to forget that people who do not profess themselves to be more than ordinary men mostly live according to unleason; or what seems such to the philosophers Moderns, who make to themselves metaphysical teraphim out of the Absolute, the Unknowable, the Unconscious, and the other verbal abstractions whose apotheosis is indicated by initial capitals, may find it difficult to imagine that it seemed good to ancient men to perform the same theurgic operation upon their very concrete but deceased forefathers, and to believe that, unless the Manes were regularly propitiated with a supply of such commodities as ghosts can enjoy, they would not only withdraw their benevolent protection, but would make things very unpleasant for then descendants and then fellow countrymen Yet there can be little question 3

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that this theory lies at the foundation of the ancient polity; and that the dominant purpose of its organisation was not the preservation of liberty or property, by taking order that no man used his fixedom in a way to interfere with others' freedom. but the performance of those religious obligations by which the good will of the ancestral gods might Archaic society aims, not at the freest possible exercise of rights, but at the exactest The most marked possible discharge of duties mequalities and seeming inquities of ancient law, such as succession in the male line, the acknowledgment of agnate blood relationship only, adoption, divorce for bairenness, are direct consequences of the religious foundation of ancient society. Thus the whole tabric of à priore political speculation which we have had under consideration is built upon the quicksand of fictinous history far as this method of establishing their claims is concerned, Reguneration and Individualism—enforced Socialism and Anarchy-are alike out of court.

The comments upon the preceding essays which have come under my notice, lead me to suspect that my purpose in writing them has been somewhat misunderstood.

They appear to have been regarded by the regimental socialists as an onslaught specially directed against their position, and as an attempt

to justify those who, content with the present, are opposed to all endeavours to bring about any fundamental change in our social arrangements

Those who have had the patience to follow me to the end will. I trust, have become aware that my aim has been altogether different. Even the best of modern civilisations appears to me to exhioit a condition of mankind which neither embodies any worthy ideal nor even possesses the ment of stability I do not hesitate to express the opinion, that, if there is no hope of a large improvement of the condition of the greater part of the human family, if it is time that the increase of knowledge, the winning of a greater dominion over Nature which is its consequence, and the wealth which follows upon that donumon are to make no difference in the extent and the intensity of Want, with its concomitant physical and moral degradation, among the masses of the people, I should had the advent of some kindly comet which would sweep the whole affair away, as a desnuble consummation. What profits it to the luman Prometheus that he has stolen the fire of heaven to be his servant, and that the spuits of the earth and of the air obey him, if the vulture of pauperism is eternally to tear his very vitals and keep lum on the bunk of destruction

Assuredly, if I believed that any of the schemes litherto proposed for bringing about social amelio-

ration were likely to attain their end, I should think what remains to me of life well spent in furthering it. But my interest in these questions did not begin the day before yesterday, and, whether right or wrong, it is no hasty conclusion of mme that we have small chance of doing wisely in this matter (or indeed in any other), unless we think rightly Further, that we shall never think rightly in politics until we have cleared our minds of delusions; and, more especially, of the philosophical delusions which, as I have endeavoured to show, have infested political thought for centuries. My main purpose has been to continbute my mite towards this essential preliminary operation. Ground must be cleared and levelled before a building can be properly commenced, the labour of the navvy is as necessary as that of the architect, however much less honoured; and it has been my humble endeavour to grub up those old stumps of the à priori, which stand in the way of the very foundations of a sane political philosophy. To those who think that questions of the kind I have been discussing have merely an academic interest, let me suggest, once more, that a century ago Robespierre and St. Just proved that the way of answering them may have extremely practical consequences.

The task which I set before inyself, then, was simply a destructive criticism of à priori political philosophy, whether regimental or individualistic.

But I am aware that the modesty of the purely critical attitude is not appreciated as it ought to be. There is a prevalent idea that the constructive genius is in itself something grander than the critical, even though the former turns out to

the middle of the road of science, which the latter has to clear away before anybody can get forward. The critic is told. It is all very well to show that this, that, or the other is wrong, what we want to know is, what is right?

Now, I submit that it is unjust to require a

have merely made a symmetrical rubbish heap in

crossing sweeper in Piccadilly to tell you the road to Highgate, he has earned his copper if he has done all he professes to do and cleaned up your immediate path. So I do not think any one has a claim upon me to make any positive suggestions, still less to commit myself to any ambitious schemes of social regeneration such as are now as common as blackberries Reading and experience have led me to believe that the results of political changes are hardly ever those which their friends hope or their foes fear, and, if I were offered a fice hand by Almighty power, I should, like Hamlet, shudderingly object to the responsibility of attempting to set right a world out of joint But I may perhaps, without presumption, set forth some reflections, germane to the subject,

which have now and again crossed my mind About this question of government, for example ŧ

perhaps it is the prejudice of scientific habit, which leads me to think that it might be as well to proceed from the known to the unknown. Most of us, I hope, have tried their hands at self-government, and those who have met with any measure of success in that difficult art will I believe, agree with me that safety lies neither in the regimentation of asceticism nor in the anarchy of reckless self-seeking, but in a middle course Surely there is a time to submit to guidance and a time to take one's own way at all hazards.

A good many of us, again, have had practical experience of the government of that elementary polity, a family. In this business, the people who fail utterly are, on the one hand, the martinet regimentalists and, on the other, the parents whose theory of education appears to be that expounded by the elder Mr Weller, when, if I remember nightly, he enlarged upon the advantages which Sam had enjoyed by being allowed to 10am at will about Covent Garden Market, from babyhood upwards Individualism, pushed to anarchy, in the family is as ill-founded theoretically and as mischievous practically as it is in the State, while extreme regimentation is a certain means of either destroying self-reliance or of maddening to rebellion

When we turn from the family to the aggregation of families which constitutes the State, I do not see that the case is substantially altered. The

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problem of government may be stated to be, What ought to be done and what to be left undone by society, as a whole, in order to bring about as much welfare of its members as is compatible with the natural order of things? and I do not think men will ever solve this problem unless they clear their minds, not merely of the netion that it can be solved à prion; but unless they face the fact that the natural order of things —the order that is to say, as unmodified by human effort-does not tend to bring about what we understand as welfare. On the contrary, the natural order tends to the maintenance, in one shape or another, of the war of each against all, the result of which is not the survival of the morally or even the physically highest, but of that form of humanity, the mortality of which is least under the conditions. The pressure of a constant increase of population upon the means of support must keep up the struggle for existence, whatever form of social organisation may be adopted. In fact, it is hard to say whether the state of anarchy or that of extreme regimentation would be the more rapidly effective in bringing any society which multiplies without limit to a crisis.

The cardinal defect of all socialistic schemes appears to me to be, that they either ignore this difficulty or try to evade it by nonsensical suppositions about increasing the production of vital

capital ad libitum. Individualism, on the other hand, admitting the inevitability of the struggle, is too apt to try to persuade us that it is all for our good, as an essential condition of progress to higher things. But that is not necessarily true, the creature that survives a free-fight only demonstrates his superior fitness for coping with free-fighters—not any other kind of superiority.

The political problem of problems is how to deal with over-population, and it faces us on all sides I have heard a great deal about the tyranny of capital No doubt it is true that labour is dependent on capital. No doubt if, out of a thousand men, one holds and can keep all the capital,2 the rest are bound to serve him or die But if, on this ground, labour may be said to be the slave of capital, it would be equally just to say that capital is the slave of labour. A naked millionane, with a chest full of specie, niight be set down in the middle of the best agricultural estate in England, but unless somebody would work for hun, he would probably soon penish from cold and hunger, having previously lost everything for lack of protection. The state of things attributed to the tyranny of the capitalist might be far more properly ascribed to the self-enslavement

2 Using the term in its more restricted sense

<sup>&</sup>lt;sup>1</sup> The term "vital capital" is defined in an essay on "Capital and Labour 'published in *The Numberoth Contacty* (1990), which could not conveniently be included in this volume

of the wage emners. It is then competition with one another which makes his strength.

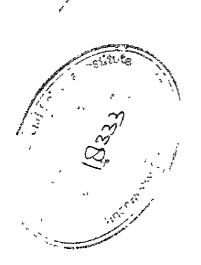
Over-population has two sources one internal by generation, one external by immigration Theoretically, the elimination of Want is possible by the arrest of both, in such a manner as to restrict the population of any area to the number capable of being fed by the agricultural produce of that area; the manufacturing and professional population being kept down to a number equal to the difference between the necessary agricultural and the total permissible population A polity of this kind might be self-supporting, and there need be no poverty in it, except such as arose from moral delinquencies or unavoidable calamities.

This is, substantially, the plan of the "Closed Industrial State "1 set forth by Fichte, and, so far as I can see, there is no other social arrangement by which Want can be permanently eliminated. For if either unrestricted generation or unrestricted immigration is permitted; or if any considerable proportion of the industrial population is allowed to depend for its food upon foreign sources, pauperism becomes imminent-in the first case, by the competition of the native and the imported workers with one another, in the second case, by the competition in the market of foreign industries of the same nature.

I offer no opinion whether Fichte's Utopia is

<sup>&</sup>lt;sup>1</sup> Der geschlossene Hundelsstaat, 1900

practically realisable or not That-about which I have a very strong opinion is, that political speculators who, while ignoring these conditions, promise a millennium of equality and fraternity, are reckoning sadly without their host, or rather hostess, Dame Nature



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